Journal
OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION

General Articles

Surgery and Obstetrics

Clinical Data

Editorial

Contents continued on adv. pages 2 and 4

Vol. 133 **October 1, 1958** **No. 7**

convenient

economical

water-soluble

Statomycin Granules*

Efficacy of Statomycin (erythromycin, CSL) has been widely acknowledged. Steadily increasing use attests to its acceptance by practitioners. Now, CSL presents Statomycin Granules — a convenient and economical oral formulation. Each pound of Statomycin Granules contains Statomycin thiocyanate representing 24 grams of erythromycin activity in a water-soluble base. Extensive laboratory and field testing have proved this formulation to be especially valuable in controlling chronic respiratory disease, coryza, blue-comb, staphylococcosis of poultry. It is a valuable aid in counteracting the effects of various stress conditions.

Statomycin Granules are now available at your service point in pound jars or packaged 6 jars to a carton.

*T.M.

CSL

CORN STATES LABORATORIES, INC. 1124 HARNEY ST., OMAHA, NEBRASKA

NEW from Norden Research

IN SMALL ANIMALS

Combat chronic dermatitis caused by fatty acid deficiencies with NUTRIDERM

1

For fatty acid deficiencies

Course dry hair coat, scaly skin, and moderate dandruff are the usual symptoms, followed by chronic dermatitis and excessive dandruff as the deficiency continues. As a result, the animal becomes more susceptible to ear canker, skin infections and recurrent respiratory conditions.

2

Treat with Nutriderm Solution

For the prevention and treatment of fatty acid deficiency, administer NUTRIDERM once daily on the feed or as a drench. In mild cases, response may occur as early as 3 to 5 days. DOSAGE: ¼ teaspoonful, 5 lbs. body weight or less; ½ teaspoonful, 5 to 15 lbs.; ⅔ teaspoonful, 20 to 30 lbs.; 1 teaspoonful, 30 to 50 lbs.

3

Complete professional formula

Linoleic, linolenic, arachidonic, oleic, palmitoleic, clupanodonic acids for therapeutic effectiveness.

Vitamin A, Vitamin D, Vitamin E and Choline.

Polyoxyethylene sorbitan monooleate and sorbitan monooleate assure uniform and continuous absorption.

Supplied In: 12—4½ oz. bottles —— Gallon

For fatty acid deficiencies • Skin and coat conditioner

NUTRIDERM

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Journal of the American Veterinary Medical Association

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NUTRITION

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Canada and Pan American Countries, $15.50; Foreign, $16.50
Published semimonthly at 600 S. Michigan Ave., Chicago 5, Ill., by the American Veterinary Medical Association. Second class mail privileges authorized at Chicago, Ill., January, 1956. Additional entry at Mendota, Ill.

Correspondence

August, 1958

Dear Dr. Aitken:

May I trouble you to have my JOURNALS sent to the address below. I have decided to stay here for the winter and do a little teaching and Bible study with the students.

Had a very kind reception from President Syngman Rhee and from the Koreans. They have a tough job ahead. Life is always a little sweeter when it contains the flavor of challenge and the spice of adventure.

Greetings to you and your staff.

Most sincerely,
s/FRANK SCHOFIELD
c/o Central Post Office, Seoul, Korea

Dr. Frank Schofield is shown with his long-time friend, President Syngman Rhee of Korea. Dr. Schofield, who just returned to Korea, has offered his service to the Veterinary Faculty at Seoul and has received the title of Honorary Professor of Pathology.

• • •

July 24, 1958

Dear Sir:

Certified teachers in Guatemala are a bit scarce. For this reason, we would like to know if there are any teachers of veterinary medicine in North America who might be disposed to sign a contract with our school.

Our School of Veterinary Medicine and Animal Husbandry is entering its third term of studies, and the Board of Assembly has decided to hire teachers on a definite time basis.

Positions are open in two departments: (1) anatomy and (2) pathology and surgery, and it is necessary to speak and write Spanish. The annual salary would be the equivalent of $8,400, passage would be paid for the teacher and his wife, and contracts would be for a minimum of two years.

Thank you for your kind cooperation. We hope, through you, to get in touch with prospective teachers soon. Very truly yours,

s/DR. FRANCISCO R. RODAS, Dean,
University of San Carlos de Guatemala,
Guatemala, Central America

CONTENTS—Continued

THE NEWS

MISCELLANEOUS

FROM FORT DODGE...

the first practical, effective treatment for LUNGWORM infection...

Dictycide®

CYANACETHYDRAZIDE FOR INJECTION

Until the development of Dictycide, there was no specific treatment for lungworm infection. Yet, the condition has been nationwide and its effects extremely costly to raisers of swine, sheep, and cattle. Incidence has been found to reach proportions up to 60% and 70% in many areas.

Dictycide, discovered during the screening of more than 3,000 agents, now gives the veterinarian a means of bringing lungworm infection under control. Exhaustive field tests over the past 18 months on more than 10,000 animals, in 33 states, have proved Dictycide's effectiveness. Injected as recommended, it expels the adult lungworms from the air passages of infected animals.

An illustrated brochure on lungworm infection, describing its treatment with Dictycide, has been mailed to all veterinarians in large-animal practice. If you did not receive your copy, or would like another, please write.

FORT DODGE

FORT DODGE LABORATORIES, INC. FORT DODGE, IOWA

Dictycide (patent pending) is supplied in a 25 gm. vial, for dilution to 100 cc. Made in U.S.A. by arrangement with Imperial Chemical Industries Limited.

Another FORT DODGE exclusive!

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TO SILENT GLOW'S COMPLETE ANIMAL CREMATORY LINE

300 pound per hour model, successfully in operation for many months at such veterinary stations as the Live Oak, Florida Hog Cholera Research Station and at many others where disposal of large animals is a daily problem.

the *NEW* 150 pound per hour model designed to solve your BIGGER and TOUGHER Disposal Problems

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And this new, fully automatic incinerator solves this problem by destroying to a *white ash* swine and other large, disposal-difficult animals, contaminated laboratory waste and refuse . . . without smoke, odors, fly ash!

The 150 model and larger units in the line are so constructed that no leakage of liquids or fats can occur . . . *the animal fat actually is used as additional fuel*—just one of the several outstanding advantages offered by Silent Glow, leaders in the combustion field for thirty-five years.

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National Coverage, Keynote of the Philadelphia Convention

The publicity received by the Ninety-Fifth Annual Meeting in Philadelphia is a reflection of the new look in veterinary public relations. Publicity in Philadelphia's own publications was subordinated to a more extensive national coverage. While difficult to evaluate quickly, spot checks in major cities revealed a satisfactory progress in nationalizing convention publicity.

Press Attendance

Miss Jean Holmes, feature writer, and Pierre Fraley, medical writer for the *Philadelphia Bulletin*, attended many sessions, conducted several interviews with prominent veterinarians, and wrote a total of eight articles on the convention.

Mr. Joe Nolan, medical writer for the *Philadelphia Inquirer*, wrote five pieces on the highlights of the meeting.

Mr. Anthony Zeccha, *United Press International*, developed a special wire service feature.

Associated Press and *United Press* stories on three sessions of the convention and on the winner of the Humane Act Award were picked up by newspapers in both New York and Chicago.

Miss Judy Randall, *Red Book Magazine*, is developing a feature on pets from convention information.

Miss Joan Sweeney, *McCall Magazine*, is doing a follow-up feature on the AVMA Humane Act Award winner of 1958, Miss Grace Fainelli.

Mr. Mike Bay, livestock editor of *Successful Farming*, attended many sessions including a special farm press-veterinary panel. Information gathered at the meeting will be featured in this well-circulated farm publication throughout the year and issued in a special "Animal Health Yearbook" next spring. Mr. David Cleary assisted Mr. Bay.

Mr. Ray Dankenbring and Mr. Dick Davids of *Farm Journal* attended several sessions and conducted special interviews as background material for a series of three articles from convention speeches as well as three feature articles on the profession, including veterinary education, meat inspection, and veterinary public health.

Various releases were mailed out during the convention to farm periodicals throughout the United States and Canada and special features are being developed from convention papers for use in other publications which have requested them.

Radio-TV Coverage

Twelve veterinarians and AVMA staff members were interviewed on 15 programs heard in and around the Philadelphia area.

Two TV news programs also featured films taken in Convention Hall, the registration area, exhibit area, and closed-circuit TV studios. Eighteen news programs carried convention items during the four-day meeting.

NBC's "National Farm and Home Hour" delivered a two-minute convention feature on August 23, warning against complacency toward livestock diseases.

"Farm News" (CBS) and Hollis Seavey's Clear Channel Broadcasting Service also gave four-minute convention roundups on programs broadcast, August 23.

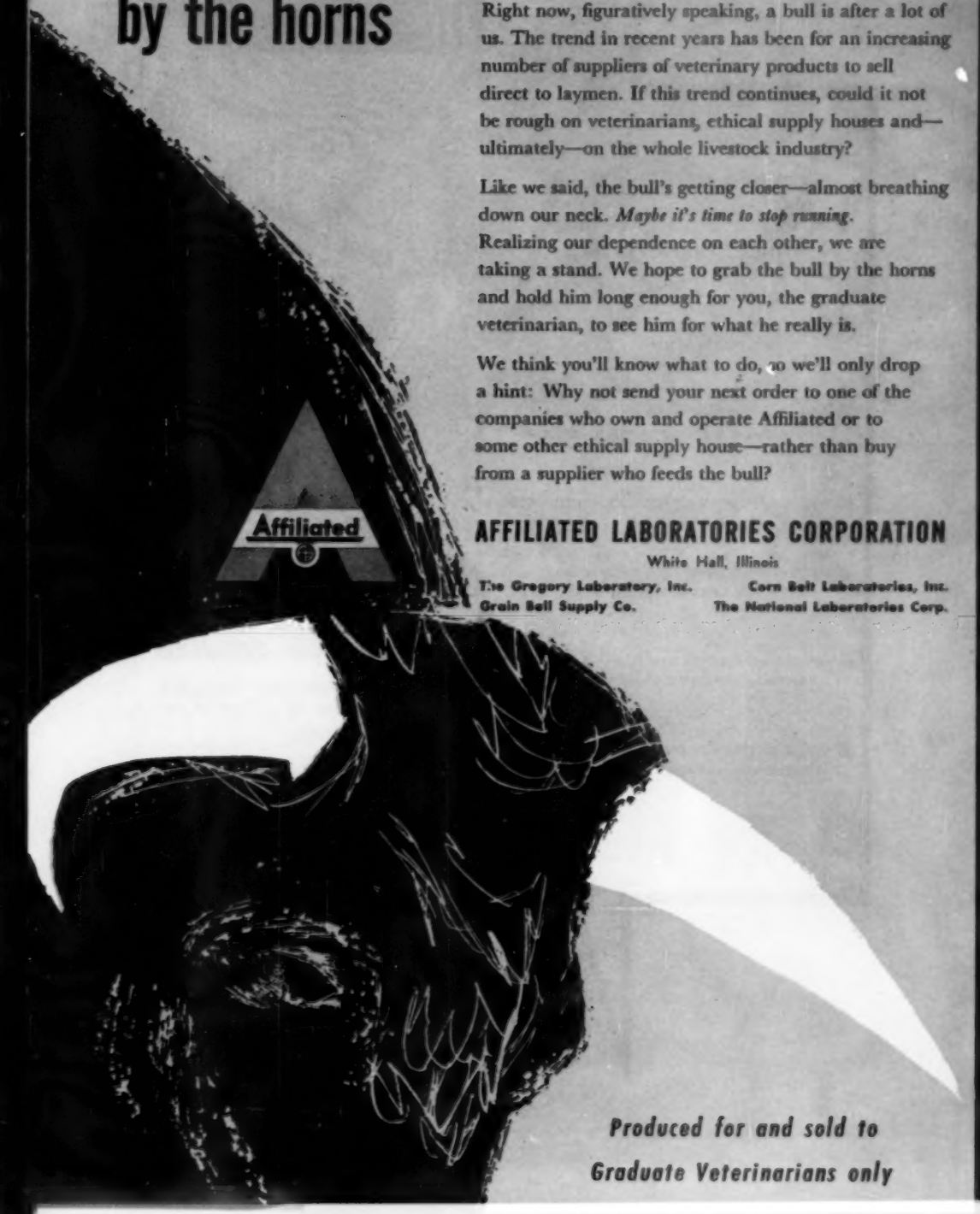
CBS's "World News Roundup" broadcast a three-minute taped summary of the convention including a one-minute interview with Dr. J. G. Hardenbergh on August 19.

The Future of Public Relations

The Executive Board of the AVMA, after considering proposals from three public relations agencies, engaged St. Georges and Keyes, Chicago and New York, as counsel to act with the AVMA public relations section, effective Sept. 1, 1958.

Drs. E. S. Tierkel, Atlanta, Ga., and J. W. Cunkelman, Chicago, Served as AVMA representatives to the planning committee for the first Institute on Veterinary Public Health Practice, to be held in Ann Arbor, Mich., on Oct. 6-9, 1958.

Let's take the bull by the horns



Did you ever try to outrun a bull? Most of us have—at one time or another. And while the chase is fun, the consequences are bad if we don't succeed.

Right now, figuratively speaking, a bull is after a lot of us. The trend in recent years has been for an increasing number of suppliers of veterinary products to sell direct to laymen. If this trend continues, could it not be rough on veterinarians, ethical supply houses and—ultimately—on the whole livestock industry?

Like we said, the bull's getting closer—almost breathing down our neck. *Maybe it's time to stop running.* Realizing our dependence on each other, we are taking a stand. We hope to grab the bull by the horns and hold him long enough for you, the graduate veterinarian, to see him for what he really is.

We think you'll know what to do, so we'll only drop a hint: Why not send your next order to one of the companies who own and operate Affiliated or to some other ethical supply house—rather than buy from a supplier who feeds the bull?

AFFILIATED LABORATORIES CORPORATION

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The Gregory Laboratory, Inc. — Corn Belt Laboratories, Inc.
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Produced for and sold to Graduate Veterinarians only

Graduate Veterinarians only

VpC CON-O-MINERAL SUPPLEMENT

lowers pig loss . . . builds pork faster, at less cost

FOR SOWS, BABY PIGS, GROWING AND FATTENING HOGS

Your recommendation of a swine feed fortified with VpC Con-o-mineral Supplement can be your client's best weapon against nutritional deficiencies. Con-o-mineral builds heavier, stronger, ricket-free bone . . . helps grow more pork cheaper and faster.

Ingredients include: calcium, phosphorus, potassium iodide with cobalt-ferrous-copper-zinc-manganese sulphates, plus other trace elements . . . dried brewer's yeast and yeast cultures providing vitamins A, D, niacin, thiamin, panothenic acid, pyridoxine, choline, riboflavin and other B complex factors.

A sow has to wean 5 pigs to make production costs. According to a recent estimate, we market only 5½ out of 10 pigs farrowed. The difference between profit and loss is a narrow margin. Your clients will profit *MORE* when you recommend Con-o-mineral.

VpC SUPPLEMENTS NATIONALLY ADVERTISED!

Farmers in your area are reading about the cash-saving, production-increasing values of Vitamineral Supplements in FARM JOURNAL, FARM QUARTERLY and other farm papers. Each VpC advertisement emphasizes that only you, as a veterinarian, are authorized and qualified to recommend and dispense Vitamineral Supplements. (Write for confidential prices.)

31st Ed. of VpC Feed Book now ready. Send for your supply.

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precision veterinary equipment

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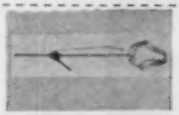
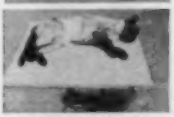


FRANK'S FETAL EXTRACTOR helps you through difficult OB cases. Portable, quick and easy-to-assemble. Write for folder.

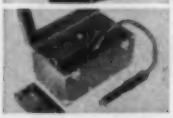
PLEXI-SIGN LETTERS in all sizes and colors, install them with a screwdriver or adhesive cement. Write for folder.

PLASTI-PLATED CAGE WARDS are simple to put together. We send you materials, full instructions. Write for folder.



RADIANT WARMING PANEL is plasti-plated to resist clawing, stains, urine. Shock-proof. Write for folder.

INSTRUMENT AND SERUM CASE has baked black enamel over steel. Brass trim. Six models. Write for folder.



ELECTRIC FIRING IRON, the modern way to fire horses, remove growths, tumors. Write for folder.

ELECTRIC BRANDING IRON heats in 90 seconds, doesn't smoke, weighs 11 ounces. B, T, V brands. Write for folder.

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SWANSON VACCOMATIC SYRINGE will help you vaccinate up to 400 head of cattle an hour. Write for folder.

NEW IncinaMATOR is first really fool-proof veterinary clinic incinerator and cremator. Write for folder.

New Nicholson Trans-Jector uses no vacuum tubes; weighs a mere 16½ pounds

Here is our new Trans-Jector—the most advanced electronic device in the world of veterinary practice. The new Nicholson Trans-Jector has all transistor construction which completely *eliminates* old-fashioned vacuum tubes. And, the Trans-Jector is lightweight—actually weighs 50 to 60 pounds *less* than similar devices!

The powerful Trans-Jector testing unit weighs only 16½ pounds; the probe only 3 pounds. The Trans-Jector is a compact 18" long x 7" high x 4" wide. Mail the coupon below today for detailed information, prices and list of special field accessories.

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- ☐ Plasti-Plate
- ☐ warming panel
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- ☐ Swanson syringe
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THE UREMI-LAB

(A pocket-sized test kit for estimating blood urea)

With this simple pocket test you can estimate blood urea in the barn or while the dog or cat is on your table. No centrifuging —no involved procedure—just an easy test, using .2cc of whole blood as taken directly from the animal.

The UREMI-LAB provides results equally well on small or large animals. Requires only several minutes time.

The UREMI-LAB enables you to greatly strengthen your diagnosis (and prognosis) in canine nephritis, in leptospirosis or distemper with kidney effects, in bovine and equine kidney involvements, in cardiac conditions where uremia is a factor—in over forty-five large and small animal diseases.

Often saves many dollars by allowing you to advise whether a steer is uremic or ready for marketing.

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Veterinarians Only

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NOW IN A VARIETY OF DOSAGE FORMS

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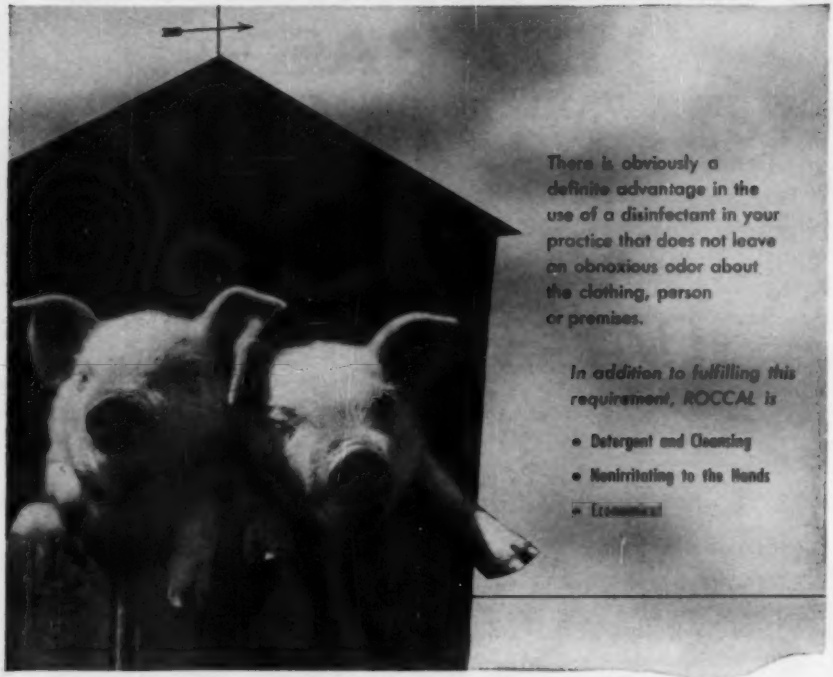

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ROCCAL is eminently useful as a germicide. It is not for surgical use but is intended for the general disinfection of floors, walls, kennels, stables, milking equipment, operating tables, furniture, wash tubs, eating and drinking utensils.

ROCCAL 10% SOLUTION supplied in 1 pint, 1 quart and 1 gallon bottles.
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informative data sent on request

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Roccal, trademark reg. U.S. Pat. Off., brand of sanitizing agent (active ingredient—benzalkonium chloride, technical, 10%; inert ingredients, 90%).

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BIG REASON WHY KASCO® IS AMERICA'S BEST-RESEARCHED, MOST SCIENTIFIC DOG FOOD

At America's largest dog nutrition research center—the Kasco Research Kennels at Waverly, N. Y.—over 20 years of work has gone into perfecting the balanced, concentrated meal that is today's Kasco Dog Food. This kennel and laboratory, recently expanded at a cost of a quarter-million dollars, has led the way to improved nutrition for the dog and unprecedented economy for the owner.

In these ultra-modern laboratories, trained technicians under Dr. Victor Heiman, Director, have greatly broadened the science of dog nutrition. Their research has enabled them to develop a dog food that is *complete*—for puppies or mature dogs—any size, any breed—even during gestation and lactation.

The 300-dog kennels have advanced lighting and ventilating facilities and a uniquely effective sanitary system. Included are a food-mixing room, kitchen, hospital, metabolism room, maternity ward and isolation ward so Kasco scientists can continue to make Kasco the best dog food you can buy.

Here scientific flavor-preference tests are being made. Each dog is presented with two bowls containing carefully weighed quantities of different dog foods. Every leading dog food has been so tested.

After the dog has eaten its fill, the remaining food is once more weighed to determine which was the more tempting. Through hundreds of such tests, Kasco has retained its superiority.

At Waverly, generations of dogs have been weaned on Kasco and fed this completely balanced food all their lives. Years of tests have proved conclusively that although other foods can be added, Kasco alone provides every nutritive element known to be needed. *It adds up to this: no matter what you are feeding now, switch to Kasco and water. Your dogs will be in better condition than ever before—or will be in just as good condition at a lower cost!*

KASCO® DOG FOOD

VISIT THE FAMED WAVERLY KENNELS AND RESEARCH CENTER AT WAVERLY, N.Y.

Corn Products Refining Company

Do your clients finish

SQUIBB IS PROUD TO INTRODUCE **3** *entirely new*

WEIGHT GAINING

SYNOVEX IMPLANTS

SYNOVEX-S for STEERS

SYNOVEX-H for HEIFERS

SYNOVEX-L for LAMBS

- **HIGHER WEIGHT GAINS** at lower cost per lb. of gain
- **IMPROVED FEED CONVERSION** . . . more meat from every lb. of feed
- **NEW IMPLANTER** . . . speedy, easy-to-use, no pre-slitting of skin
- **FASTER TURN-OVER** . . . animals reach market weight sooner
- **SUPERIOR PHYSICAL APPEARANCE** . . . better bloom, fine finish
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- **QUALITY MEAT** . . . excellent texture, rich bright red color

The INTRODUCTION of the Squibb family of Synovex balanced hormone implants is one of the most significant advances in livestock finishing in many years. With Synovex S, H and L, you can help your clients get up to 20% more meat from every pound of feed—whether they feed steers, heifers or lambs.

The right KIND of hormones. Synovex implants contain only naturally-occurring hormones (no hormone-like chemical compounds are used). Each Synovex formula was developed for one type of animal, and contains only those hormones which stimulate maximum improvement in rate of gain and feed conversion while maintaining carcass grade.

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The right IMPLANTER. The Synovex all metal implanting instrument is well designed, easy to use and efficient. No pre-slitting of skin with knife is required.

The right TESTING PROGRAM. Synovex S, H and L were rigorously tested and proved at University Experiment Stations, on the farms, and in feedlots.

STEERS, HEIFERS OR LAMBS
to market weight?

YOU CAN USE AND RECOMMEND THESE SYNOVEX BALANCED HORMONE IMPLANTS WITH CONFIDENCE

New and improved SYNOVEX-S FOR STEERS at new low price

Now the famous Synovex Steer Finishing Implants have been modified in form and formula for even better absorption and utilization of hormones and easier implanting—*at a new low price*. Steers make higher weight gains at lower cost per lb. of gain, reach market weight faster with better bloom, fine finish and quality meat. No downgrading. New implanter eliminates pre-slitting of skin.

SYNOVEX-S contains 200 mg. of progesterone and 20 mg. of estradiol benzoate. Contents of entire 1-dose cartridge (8 tiny pellets) are implanted simultaneously. Recommended for steers weighing from 400 to 1000 lbs. One implant lasts entire finishing period.

SYNOVEX-H the first and only implant FOR HEIFERS

Now, for the first time, Heifers can be *safely* implanted. Synovex-H produces dramatic improvement in rate-of-gain and feed conversion without undesirable carcass changes. Your clients get faster weight gains, better bloom, fine finish, excellent texture and quality of meat.

SYNOVEX-H contains 200 mg. of testosterone propionate and 20 mg. of estradiol benzoate. Contents of entire 1-dose cartridge (8 tiny pellets) are implanted simultaneously. Recommended for heifers weighing 400 lbs. or more. One implant lasts entire finishing period.

Another Squibb discovery SYNOVEX-L FOR LAMBS

Developed exclusively for lambs. Now you can help your clients get feeder lambs to market up to 30 days faster—without downgrading. Feed conversion improves up to 20%. Help sheepmen get the maximum profit out of the short lamb feeding period with Synovex-L!

SYNOVEX-L contains 25 mg. of progesterone and 2.5 mg. of estradiol benzoate. Contents of entire 1-dose cartridge (2 pellets) are implanted simultaneously. One implant lasts entire finishing period, from 60 to 150 days.

NEW IMPLANTER— NO PRE-SLITTING OF SKIN WITH KNIFE

You'll like this new implanter. It's easy to use, speedy and efficient for steers, heifers and lambs. No pre-slitting of skin with knife; merely insert needle point between skin and cartilage of ear and depress plunger. A strong, all-metal, precision-made instrument designed for years of reliable service. (Each single dose of Synovex S, H and L comes ready for use in a plastic cartridge which fits into hollow shank of implanter.)

SYNOVEX-S, H and **L** are available in **10-IMPLANT** and **100-IMPLANT** packages. For best results, feeder stock should be free from parasitism and feedlot diseases.

For additional information about **Synovex-S** **Synovex-H** **Synovex-L** write: SQUIBB, *Veterinary Department* 745 Fifth Avenue, New York 22, N. Y.

Synovex has been cooperatively developed by E. R. Squibb and Sons and The Upjohn Company. "Synovex" is a Squibb trademark.

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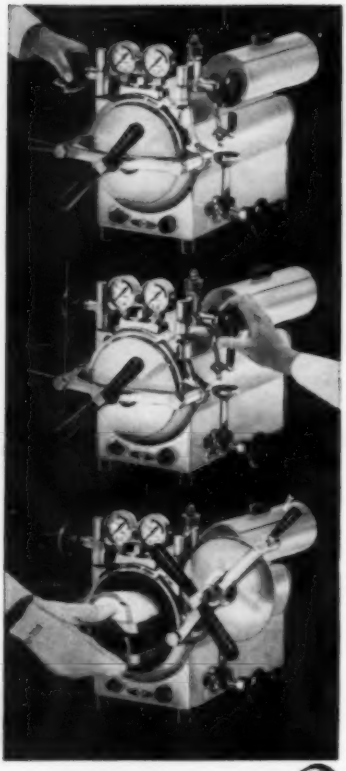
WHY BOIL?

when you can sterilize FASTER and SAFER in the

PELTON AUTOCLAVE

So Easily Operated



TRANSFER
After loading, simply transfer steam from reserve to sterilizing chamber. In only a few seconds, temperature is attained.

DISCHARGE
When sterilization is completed, discharge steam to condenser after closing transfer valve and crack open the door.

UNLOAD
In a minute or two entire contents are removed completely sterile and dry. The autoclave is ready for second load.

AVAILABLE IN 2 SIZES:

Model FL-2,
6" x 12" sterilizing chamber
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Gentlemen: I am interested in the Pelton time-saving Autoclave. Please send me more information and prices on model.

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FERAJECT'S EXCLUSIVE FEATURES

Feraject protein complex-iron injectable contains 100 mg. per 2cc, which gives baby pigs the all important amount of iron necessary for the prevention of iron deficiency anemia.

Aside from the high concentration of complexed iron, Feraject contains NEOJEL as an adjuvant with a stabilizing effect, Vitamin B_{12} as a growth stimulant; and Pyridoxine Hydrochloride (B_6) as an aid to amino acid metabolism.

Feraject is non-toxic and when used as directed, will not disrupt the homeostatic condition present in the normal animal.

The recommended therapeutic dose of Feraject is 2cc. For prophylaxis of pig anemia, the dose may vary from 1cc to 2cc depending upon the degree of iron deficiency.

Feraject is available exclusively to veterinarians in 30cc (15 dose) and 100cc (50 dose) vials.

DIAMOND LABORATORIES

DES MOINES, IOWA

FIRST IN PROGRESS...THROUGH RESEARCH

quality products

of original research

to help you in your practice

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for dogs of all ages

METABOLIC REGULATOR

A balanced combination of three key hormones to help overcome endocrine imbalance in dogs that show depression, fatigue, lowered resistance, effect of stress and disease, or the slow-down of old age. *Anabolin* is particularly useful in treating dermatologic conditions caused or influenced by hormone imbalance.

Triocil®

for large and small animals

BRAND OF HEXETIDINE

Provides markedly effective antimicrobial action through *prolonged tissue affinity*, resists licking, washing or rubbing off.

controls these topical infections

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Nonsedative tranquilizer, also aids in the control of canine chorea and potentiates the action of anesthetics.

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Enter Ken-L-Biskit's Cruft's Dog Show Contest!

GRAND PRIZE! All expenses paid to attend famous Cruft's Dog Show at London's Olympia. World's largest dog show in number of total entries. February 6 and 7, 1959.

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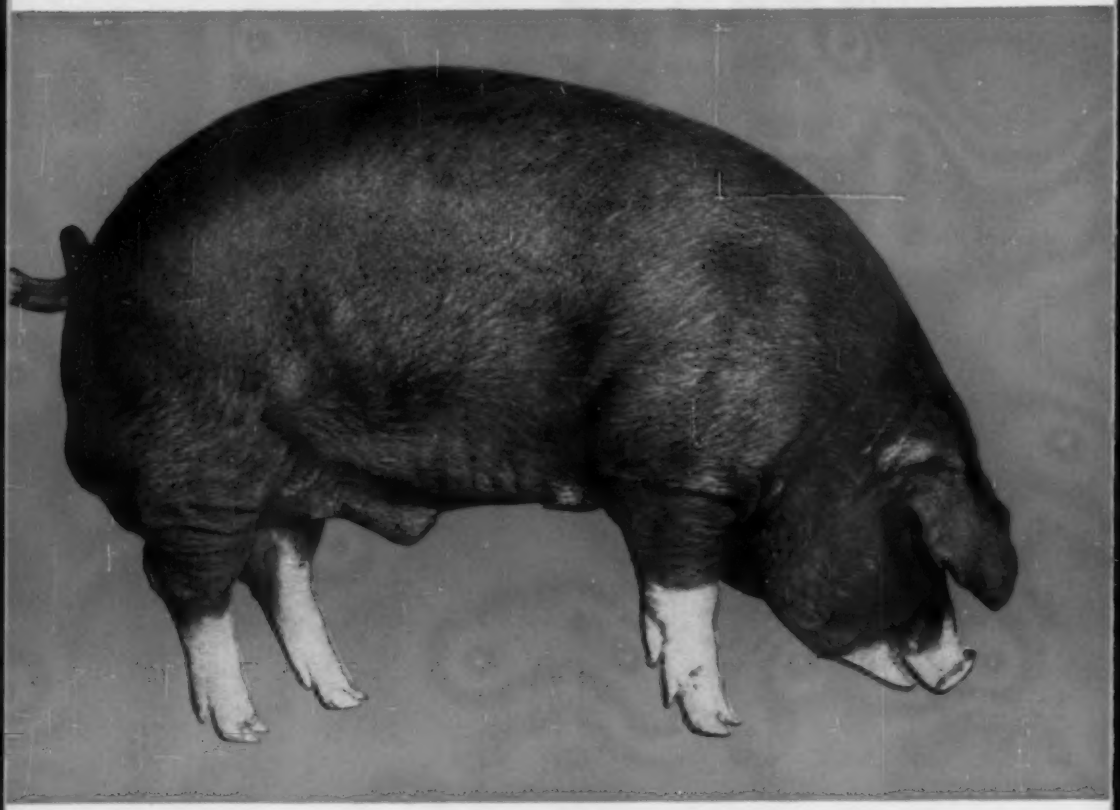

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Pneumonia in Newly Weaned Calves— Report of a Field Study

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RESPIRATORY INFECTIONS of cattle cause a great economic loss to the livestock industry of the world. Nomenclature used to describe this group of bovine maladies is far from satisfactory. Misleading terms such as "shipping fever," "hemorrhagic septicemia," or "stockyards pneumonia" have been used to describe this group of bovine diseases, due to varying etiological factors, which usually progress to pneumonia.

These conditions have often occurred following the movement of cattle, usually to the feedlot, by rail, truck, or trail, but this syndrome is not limited to such animals. It can and does affect calves that are still nursing cows, or can occur shortly after weaning.

One such outbreak occurred on a Montana ranch during the fall of 1956. This ranch includes approximately 200,000 acres and is divided into three major parts which may be termed the northern, southern, and western sections. The northern and southern sections are the main summer ranges. The western section serves as the ranch headquarters and wintering area. In addition, there are several smaller farms near the western section. Normally, 3,000 breeding cows are kept and those from the northern and southern sections do not have contact with each other.

METHODS OF WEANING IN THE HERD

Until 1951, the cows and calves were moved from summer range in the northern section to a railroad stockyard where the calves were weaned either on the day of shipment or one day before. The weaned calves were transported by train for 35 miles, then driven by trail about three miles to a farm. The driving of newly weaned calves often resulted in many difficulties.

All calves were dipped for the control of lice the day after their arrival and then placed in a holding pen. The next morning, each calf was put into a squeeze chute, dehorned and branded on the jaw. In addition, heifers were given strain 19 *Brucella abortus* vaccine and late bull calves were castrated. Following these procedures, the calves were turned out to fall pasture. Severe weather set this schedule back one or two days. A loss of 2 calves per 1,000 following this type of handling was considered normal.

In 1951, it became apparent that calves could no longer be handled in such a rough manner. Each year, more calves had pneumonia at weaning time despite better care. Therefore, the calves were no longer dipped, branded, or dehorned at weaning time, and vaccination for brucellosis was delayed. At one weaning period, 2,000 calves were given anti-hemorrhagic septicemia serum, with no apparent beneficial results.

In 1955, many calves developed pneumonia before they were weaned. Three mature animals also died of the disease. In an effort to minimize losses, the calves were allowed to remain with the cows until a later date.

In 1956, a concentrated effort was made to determine whether improper management during weaning or a specific disease,

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Scientific Paper No. 1734, Washington Agricultural Experiment Stations, Pullman, project 1345.

Fig. 1—Normal cows and their calves in typical range country prior to weaning.

or a combination of these factors, was involved. With 2,600 calves to be weaned, all were given two injections of a triple bacterin containing Pasteurella organisms and those which cause malignant edema and black-leg. One injection was given in April and May, during the castration and branding procedure, and the second in August.

GROUPS A, B, AND C

Calf weaning began Oct. 16, 1956, with the long-range weather forecast predicting favorable weather. The first 1,000 calves were taken from the southern section (fig. 1). As in the past few years, these calves were separated into three groups (table 1) and trucked to the wintering farms. The longest trucking distance was about 60 miles.

Each group was placed in a small pen, since close confinement was necessary to control the walking and bawling generally associated with weaning. The calves were fed good quality grass hay and started on a supplement of whole oats. After four to five days, they were turned into adjacent hay meadows where they could eat grass. On the day they were turned out, a few sick calves were noticed in each of the three groups. The next day, 9 were dead and a veterinarian (J.H.N.) was called.

At the first examination, a majority of the calves were normal. The calves were repeatedly examined during the course of the disease. The first sign of illness that could be detected was a serous to mucous nasal discharge, followed by a dullness in the eyes, slightly drooping ears, and lassitude (fig. 2).

These calves generally had temperatures ranging from 105 to 107 F. The sick calves next showed inappetence and, later, an increased respiratory rate and moist rales (fig. 3). Swelling and edema of the throat was noticed in some of the most severely affected animals. If untreated, death usually occurred within 24 to 48 hours after the first clinical signs. Ten to 15 per cent of the calves had a drooping ear (fig. 4) and a subsequent purulent discharge from that ear or both ears.

DIAGNOSIS AND TREATMENT

Sensitivity tests, using bacteria isolated from the lungs of the first calves that died, showed penicillin to be the least effective antibiotic. Streptomycin exhibited some inhibitory action and the broad-spectrum antibiotics the greatest effectiveness. Broad-spectrum antibiotics were given intravenously or intraperitoneally to the first sick calves but, as the number of sick animals increased, it became nearly impossible to use such therapy because of the time involved. Instead, because streptomycin is not available alone in a long-lasting medium and since penicillin is cheap, long-acting fortified penicillin and streptomycin

Fig. 2—Calf showing lassitude — a typical clinical sign of respiratory infection.
Fig. 3—Calf with a severe respiratory infection, showing purulent nasal discharge and encrusted nose.
Fig. 4—A calf (left) with a drooping right ear.

was given intramuscularly for one to four days, depending on the response.

The first dose of 2 million units of penicillin and 5 Gm. of dihydrostreptomycin was reduced on each successive day. Some animals were also given an injectable expectorant.

Group A—Steer Calves.—By the tenth day following weaning, 150 of the calves in group A had been treated. Some may have been treated unnecessarily but, because of the high morbidity, this was considered good insurance. On the tenth day, the remaining normal appearing calves were injected with a long-acting penicillin and streptomycin product, and no more cases of respiratory infection were detected.

Group B—Heifer Calves.—With no facilities for the confinement and treatment of calves on this farm, it was necessary to chase, rope, and throw each individual. (fig. 5). As a result, no mass therapy was given. It was necessary to continue individual treatment for 21 days following weaning.

Group C—Mixed Calves.—This group of smaller calves was given the penicillin-streptomycin therapy on the tenth day, as were those in group A. However, fewer animals had been given individual treatment and death losses were higher. The mass therapy was not nearly as effective in this group as in the first group. This may have been due to differences in the feeding practices, detection of sick animals, and promptness of treatment. The smaller size and poorer condition of these calves may also have been a factor.

The morbidity and mortality rates on these calves, the first ones weaned, is summarized (table 1).

Fig. 5—Method of giving an intraperitoneal infusion to a calf on the range.

Necropsy

Examination of the exterior of the calves that died, 24 to 48 hours after the first signs of illness, revealed no abnormalities. There was no diarrhea, the nose was not dry or encrusted, and the eyes appeared normal.

Internally, the most impressive lesion was a severe fibrinous pleuritis. An abundant yellowish pleural fluid coagulated rapidly on exposure to air. A confluent pneumonia affected the anteroventral two thirds of both lungs.

In some calves, a gelatinous serosanguineous exudate was found in the jugular furrow from the submandibular space to the thoracic inlet. The bronchial lymph nodes, and those of the head, neck, and mediastinum, were enlarged and reddened. Petechiae and ecchymoses were found on the endocardial and epicardial surfaces of the heart, especially in the region of the pulmonary artery. Hemorrhages were also scattered throughout the thymus gland and in the pericardium. No hemorrhages were found on the serosal and mucosal surfaces of the digestive organs. There was a slight catarrhal enteritis, a yellowish fluid in the intestines and, in some calves, the mucosa of the abomasum showed hyperemia.

The liver was larger and lighter in color than normal. There was superficial necrosis and erosion of the mucosa of the anterior portion of the nasal cavity, sinuses, and turbinates, with plaques of fibrinopurulent exudate loosely attached.

Specimens were collected from 4 untreated calves that had died 24 to 48 hours after the first signs of illness. Some of this fresh material was taken to the Montana Veterinary Research Laboratory at Bozeman, Mont., for culture. Impression smears made from the lungs of these 4 animals, and the pleural fluid of 1, when stained with Giemsa's and Gram's stain, disclosed gram-negative bipolar rods in massive numbers.

Cultures were made from the lungs of animals that had died of a respiratory disease. Results at both laboratories (Bozeman and Pullman, Wash.) showed that the bacteria isolated from these tissues corresponded most closely to *Pasteurella hemolytica.*

TABLE 1—Incidence of Disease and Death Following Weaning of the First Three Groups of Calves

	Total calves	No. treated	Morbidity (%)	Morbidity (No.)	Mortality
Group A Steer calves	384	200	52	12	3.1
Group B Heifer calves	380	125	33	15	3.9
Group C Mixed calves	226	113	50	27	11.9
Totals	990	438	44.2	54	5.6

Animal Inoculation.—Mice were inoculated with a 10 per cent saline suspension of infected lung. Half of the mice injected intraperitoneally died. Those given material intranasally showed no adverse effects.

Intravenous inoculation of lung suspension produced no ill effects in rabbits. The intraperitoneal inoculation of a 10 per cent lung suspension killed guinea pigs in less than 24 hours. Chicken embryos inoculated with this material died in less than 24

hours. Two calves were inoculated intratracheally with 10 ml. of a 10 per cent pooled suspension of infected lung from the 4 calves and, within 48 hours, both calves had temperatures above 105 F. and showed clinical signs of pneumonia. Temperatures stayed above 104 F. for six days. One of these calves, killed for study, showed confluent pneumonia involving the lower and anterior half of both lungs. The other calf recovered without treatment.

Cultures were made from all of the laboratory animals and chicken embryos that died, and an organism having the characteristics of *Pasteurella hemolytica* was recovered.

GROUPS D AND E

Group D.—On Oct. 30, 1956, 600 calves from the northern section of the ranch were placed in a feedlot. These were the first and only calves weaned from that summer range. Upon arrival at the feedlot, they were allotted to groups of approximately 80 and treated as separate units. They were fed a good quality grass hay and supplement, with alfalfa hay later replacing the grass hay.

Each day, temperatures were taken of representative numbers of calves in each pen with an electronic thermometer. Each pen of calves was treated as a unit, using different methods, and the results were compared.

Calves which were treated before they developed signs of illness, regardless of whether they were given a long-acting penicillin preparation which did or did not contain streptomycin, usually had to be re-treated. In one pen, with twice as much area for the same number of animals, which allowed the calves more uninterrupted walking space, more calves required treatment than in any other pen.

Group E.—On Nov. 6 and 7, 1956, the remaining 1,000 head from the southern range were brought to the feedlot. Again, as in group D, when many calves required individual treatment, and the others seemed to be showing preliminary signs of respiratory infection, all the calves were treated. Mass therapy as previously described (group A) did not completely halt the development of disease, but it did diminish it considerably if given at the optimum time. Of the 1,600 calves in groups D and E, 165 were given individual treatment—a morbidity of approximately 10 per cent.

No deaths occurred from respiratory infection in the calves in groups D and E.

In deciding the optimum time to treat a pen of calves, the temperature of the animals was a major consideration. A temperature of 104 F. was used as the dividing line between normal and abnormal; however, it was necessary to allow for the time of day and the degree of excitement. A few calves that looked normal were found to have temperatures ranging between 105 and 107 F.

DISCUSSION

This severe epizootic of bovine respiratory infection occurred despite the fact that all of the calves on this ranch had been vaccinated twice, at a three-month interval, with a trivalent bacterin which supposedly assured their immunity to "shipping fever," in addition to blackleg and malignant edema.

The morbidity and mortality experienced at the beginning of the outbreak would seem to indicate that there was little resistance to the respiratory infection. Two hypotheses which might be advanced to explain this lack of immunity are: (1) Products from the proper species or strains of bacteria might not have been included in the bacterin; and (2) some etiological factor, not as yet determined, may have been involved.

By the use of an electronic thermometer, many temperatures can be taken with relative ease. This is a self-contained, portable, battery operated, direct reading, thermo-element instrument.* Accurate temperature readings are obtained within 5 to 10 seconds by inserting the probe end of a 10-ft. leadwire into the rectum of an animal.

A rise in temperature is one of the first signs of this disease, and usually is present before other signs of illness are detectable. The herd history, the number of clinically sick animals, and the number of animals having high temperatures will help one decide whether to treat the animals individually or on a herd basis.

At the beginning of a mild outbreak (5 to 10% morbidity), individual daily treatment would probably be feasible and satisfactory; however, if the morbidity is higher than 10 per cent, herd treatment at the proper time should be considered.

There are several advantages both to the

*Manufactured by Yellow Springs Instrument Co., Inc., Yellow Springs, Ohio.

owner and to the veterinarian in treating all animals that have been exposed. With herd treatment, further developing cases may be reduced to a minimum (*i.e.* group A). Also, many animals which are in the incubative stage of the disease will thus be treated. By using a temperature rise as an early indication of infection, animals can be treated with a variety of drugs with reasonable expectation of recovery. The earlier that prophylactic measures are taken after exposure, the more rapid will be the recovery and the fewer will be the chronic cases.

Close confinement to minimize "fence walking" and bawling seemed to reduce the "stresses" commonly associated with weaning. Feeding good quality grass hay, together with reducing "stresses," should help maintain the resistance of cattle to respiratory infections.

Treatment and prophylaxis may have helped reduce the morbidity and mortality in groups D and E, but other factors such as differences in the environment, resistance of the calves, weaning times, and the pathogenicity of the etiological agents may have been partly responsible.

SUMMARY

In an outbreak of bovine respiratory infection in newly weaned calves, the morbidity in the first 1,000 animals was 44.2 per cent and the mortality 5.6 per cent. A severe pneumonia was found on necropsy. *Pasteurella hemolytica* was recovered from the lungs of animals dead of this disease.

Tests showed the infectious material to be least sensitive to penicillin, fairly sensitive to streptomycin, but most sensitive to the broad-spectrum antibiotics. Giving the latter drugs intravenously or intraperitoneally required too much time so therapy was limited to giving a long-acting penicillin-streptomycin compound intramuscularly.

The remaining 1,600 calves were placed in small pens in a feedlot following weaning, and the long-acting penicillin and streptomycin preparation was used both as a therapeutic and prophylactic measure. The morbidity was 10 per cent and no mortalities occurred.

Brucella Suis in Hares.—Brucella orchitis was found in 23 of 3,517 hares, in Romania. Organisms isolated from 20 were identical with the Danish strain of *Brucella suis*. In certain districts, 20 to 24 per cent of the hares were affected.—*Vet. Bull. (July, 1958): Item 2047.*

Brucella in Milk from Normal Udders

In a quantitative study on milk from udders which had passed slaughter inspection, Brucella were detected in 36 per cent of 80 Brucella-infected cows.

The number of organisms eliminated (1,000 to 10,000/cc. of milk) varied roughly with the agglutination titer of the milk.

This does not mean that a low titer milk might not contain a large quantity of Brucella.—*E. Schaal in Berl. u. Münch. tierärztl. Wchnschr. (Aug. 1, 1958): 292.*

Brucellosis in Veterinarians

Veterinarians in some countries are exposed almost daily to highly infectious material. Infection with Brucella is scarcely possible through an intact skin. Infection in veterinarians is estimated to range as high as 80 per cent in Switzerland, and 94 per cent in Denmark.

The disease is treated chiefly with broad-spectrum antibiotics but these were found effective in only 20 to 30 per cent of the cases even when persons were treated during the first eight weeks of infection. They are less effective in chronic brucellosis.

Some effects of the disease (liver and circulation injury) may not be recognized until much later.—*H. Linsert in Monatsh. f. Vet.-med. (July 1, 1958): 407-410.*

Symposium on Listeriosis in Man and Animals

The following are abstracts of papers presented at the Symposium on Listeriosis in Man and Animals, held at the Justus Liebig University in Giessen, Germany, June 27-28, 1957, and published in *Zentralblatt für Veterinärmedizin*, March, 1958.

Part 1.—A high percentage of children and adults without clinical histories of listeriosis, in Germany, have a low agglutination titer (up to 1:160). The titer may be due to subclinical infections or may be caused by antibodies against organisms serologically related to *Listeria* (*Erysipelothrix*) *monocytogenes*. Serological tests for listeriosis have been useful in cases of chronic septicemia, chronic disorders of the central nervous system, and in women who habitually abort. After a serological

diagnosis, six women were treated for listeriosis and each delivered a healthy child. —*H. P. R. Seeliger, Bonn.*

• • •

Part 2.—Listeriosis takes a variety of forms in different animals with such forms as meningoencephalitis, abortion, or septic lesions in all organs predominating in different species. The lesions are strikingly similar in man and other animals. Little is known about natural infection because there are no primary lesions. Septic listeric infections seem to be transmitted to fetuses through the placenta materna and placenta fetalis.—*G. Pallaske, Leipzig.*

• • •

Part 3.—*Listeria monocytogenes* occurs in the host (1) as a saprophyte, (2) in localized disease, or (3) in septicemia. Listeric septicemia is rare in adult persons and animals since they possess a high resistance. It occurs chiefly as an infection of the central nervous system which has a low organ resistance. Still less resistant is the genital tract during pregnancy. Fetuses and newborn children and animals have a low resistance and usually develop a generalized listeric granulomatosis.

Abortion may be due to the organism entering the fetal blood vessels without causing lesions in the placenta then, after multiplication in the fetus, including the fetal placenta, the mother is massively reinfected and reacts with abortion and septic fever.—*H. Flamm, Osterreich.*

• • •

Part 4.—In animals, the most common form of listeriosis is encephalitis of ruminants, with lesions and bacteria concentrated in the medulla oblongata. It is highly fatal in sheep and goats but cows may recover without treatment. A chronic form may also exist in ruminants.

In nonruminant animals, listeric infection is usually characterized by septicemia with or without meningitis. It occurs most commonly in small rodents which may spread the disease. Infection in birds is characterized by septicemia and myocardial degeneration or necrosis. In many mammalian species, infection may produce a low grade metritis and abortion or early postnatal death. The mode of spread of the infection is poorly understood.—*M. L. Gray, East Lansing, Mich.*

• • •

Part 5.—When pregnant rabbits, sheep, or goats were orally exposed with *L. monocytogenes*, the fetuses were fatally infected, usually without signs of illness in the dam. If exposed in early gestation, the conceptus was aborted; if exposed later, the young were stillborn or survived only a few days.

Results were similar following conjunctival instillation of *L. monocytogenes* in pregnant rabbits. When instilled into the vagina just before parturition, many young were fatally infected. When the dam was infected orally, immediately postpartum, many of the young were fatally infected, presumably through the dam's milk. The young usually died from a septicemia with hepatic focal necrosis but, if they survived five or more days, death was often due to a meningitis. Prepartum treatment of the dam or immediate treatment of infected newborn rabbits with oxytetracycline seemed to give some protection.—*M. L. Gray, East Lansing, Mich.*

Listeriosis in Newborn Lambs

Septicemic listeriosis affected 29 of 75 lambs when a few days old. in Norway. Infection apparently occurred at birth or in late pregnancy. *Erysipelothrix monocytogenes* was found in the feces in the pen. The lambs were successfully treated with antibiotics.—*Nord. Vet.-med., (1958): 17 (abstr. in Vet. Bull. (July, 1958): Item 2020.*

Listeriosis in Pigs.—The first case of listeriosis ever diagnosed in pigs, in Poland, was confirmed by microbiological and serological methods. The chief signs were of a central nervous system disorder.—*B. Hauptman et al. in Med. Wtryn. (May, 1958): 261.*

Effect of Pasteurization on Listeria Organism.—*Erysipelothrix monocytogenes* was recovered in milk after pasteurization at 61.7 C. (143 F.) for 35 minutes. Surviving organisms multiplied rapidly in such milk after 48 hours at room temperature without producing gross changes in the milk or suspicious odors. Since the organism is common in ruminants and has been isolated from raw milk, this source of infection assumes importance.—*Vet. Bull. (July, 1958): Item 2023.*

A Preliminary Survey of the Incidence of Brucellosis and Leptospirosis Among White-Tailed Deer *(Odocoileus Virginianus)* of the Southeast

EMMETT B. SHOTTS, M.S.; WILLIAM E. GREER, D.V.M.; FRANK A. HAYES, D.V.M.

Athens, Georgia

IN MANY WAYS, the expansion of the domestic livestock industry of the southeastern United States is being accompanied by emphasis on conservation and game management. Since game animals are produced on lands used primarily for other purposes, and more than 85 per cent of the potential hunting land today is in private ownership or control, the farmers and ranchers hold the key to successful wildlife production in the years ahead.[5]

The propagation of fish and game is something which the private landowner can accept or reject. By his decision, he can effectively aid or hinder the increase of wildlife that sustains itself on the water and plants of his farm or ranch. Because the farmer or rancher must first look to his land for a livelihood, his land-use decisions may occasionally be adverse to wildlife increase. Because the conservation enthusiasts are primarily interested in maximum wildlife production, these two interests sometimes clash. For the preservation of this part of the nation's natural heritage, an effective understanding and cooperative arrangement must be maintained between the two groups.[5]

To afford a mutual participation between the factions involved, the continued efforts of many individuals and organizations will be essential. For the most part, the farmer and rancher are sports-minded individuals and they are usually pleased to cooperate with any reasonable program for the promotion of wildlife.

The livestock producer is rightly interested in any disease which can be transmitted between wild and domestic animals,

Fig. 1—Blood is taken from a young buck by puncture of the jugular vein.

and to what extent the former might serve as carriers. Of these infectious entities, brucellosis and leptospirosis are currently at the forefront.

This report represents the beginning of a cooperative effort to supply the information which is becoming increasingly essential for a better relationship between all concerned.

In retrospect of the limited information on the prevalence of brucellosis and lepto-

From the Southeastern Cooperative Deer Disease Study, Department of Pathology and Parasitology, School of Veterinary Medicine, University of Georgia, Athens. This cooperative-organization is the first regional diagnostic and research service established in the United States, which is maintained for the specific purpose of investigating diseases of wild deer. The joint state project is supported by the Southeastern Association of Game and Fish Commissioners and the U.S. Fish and Wildlife Service (Region 4). The participating states include Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, South Carolina, Tennessee, and Virginia.

A discussion of this preliminary survey was presented before the Twelfth Annual Meeting of the Animal Disease Research Workers in the Southern States, Oklahoma State University, Stillwater, March 6-7, 1958.

The authors thank the sportsmen, game biologists, rangers (wardens), and P-R coordinators of the southeastern states for their assistance in this project; also, Dr. C. J. Mikels, veterinarian in charge, Agricultural Research Service, Animal Disease Eradication Division, U.S.D.A., Atlanta, Ga.

TABLE 1—Blood Specimens from White-Tailed Deer Examined for Brucellosis and Leptospirosis*

State	Total specimens	Significant titers			
		Brucellosis		Leptospirosis	
		No.	%	No.	%
Alabama	68	....	....	2	2.9
Arkansas	....	....	....	....	....
Florida	9	....	....	....	....
Georgia	105	....	....	1	.9
Kentucky	53	....	....	1	1.9
Louisiana	69	1	1.4	3	4.3
Maryland	23	....	....	....	....
Mississippi	27	....	....	....	....
N. Carolina	7	....	....	....	....
S. Carolina	2	....	....	....	....
Tennessee	....	....	....	....	....
Virginia	40	....	....	....	....
Total	403	1	0.25	7	1.73

*Specimens were not received from Arkansas and Tennessee. This was not an oversight on the part of these participating states, but due to the late start of the project and subsequent request for blood samples. For each state there are many variations in the feasibility of collecting blood from deer, and these variables can be expected to be altered each year.

spirosis among wild deer of the Southeast, this annual survey has been inaugurated. The immediate purposes of this study are to determine the incidence of these diseases in the white-tailed deer and to locate any existing enzootic areas.

HISTORY

In 1941, significant blood titers for brucellosis were reported from bison and elk.[11] Evidence of this disease in moose was later described in 1942[6] and 1953.[10] Studies have been made in an effort to establish the presence of infection in white-tailed deer, and surveys conducted over several years, in North Dakota, showed the incidence of brucellosis to be only 0.22 per cent in this state's deer herds.[2,3] From 50 blood specimens examined, recent (1958) studies in Delaware failed to disclose a single reactor to Brucella antigens.[12]

It is known that serotypes of a variety of Leptospira spp. have been isolated from many wild mammals.[8] Workers in Illinois have recently shown that the deer (*Odocoileus virginianus*) in that area may possibly serve as carriers of leptospiral agglutinins.[7] Workers in Delaware failed to demonstrate any evidence of leptospirosis in that state's deer population.[12]

COLLECTION AND SEROLOGICAL PROCEDURES

Blood samples (5 ml.) were obtained from deer taken on either organized hunts or during various trapping programs. "Kill-specimens" were collected in a standard-type bleeding tube after severing one of the major blood vessels. The specimens taken during trapping or restocking procedures were obtained by puncture of the jugular vein (fig. 1).

After collection, some samples were refrigerated as long as one week prior to being forwarded to the laboratory for examination. Approximately 5 per cent of the samples were centrifuged shortly after collection and the serum was sent to the laboratory.

On receipt, the serum was separated from the formed elements by centrifugation (3,000 r.p.m. for 5 min.). Plate agglutination procedures were used to determine the presence of agglutinins for both brucellosis and leptospirosis.[9,13] Initial screening was performed at a concentration of 1:25 for brucellosis and 1:1 for leptospirosis. Positive reactions were quantitated by a twofold dilution for brucellosis and by a fourfold dilution for leptospirosis. The antigen used for the brucellosis examinations was a phenolized *Brucella abortus* antigen furnished by the Agricultural Research Service. A commercially prepared *Leptospira pomona* antigen* was used for the leptospiral determinations.

A total of 403 deer blood specimens (both sexes, ages 6 mo. to 8 yr.) was examined for *Br. abortus* and *L. pomona* agglutinins. Standards established for the presence of these diseases in cattle were used to evaluate the data obtained. Titers of 1:100 or higher were considered indicative of brucellosis, and titers of 1:160 or higher were indicative of leptospirosis.[1,4]

RESULTS AND DISCUSSION

The information acquired from this preliminary survey is presented in tabular form (table 1). Of the 403 blood specimens processed, only one was considered a reactor to the Brucella antigen; of the same specimens, seven showed a significant titer to the leptospiral antigen. These data indicated an incidence of 0.25 per cent brucellosis and 1.73 per cent leptospirosis among the deer herds of the southeastern United States.

A limiting factor in this study has been the relatively small number of blood specimens processed. It should be emphasized, however, that this investigation was of a pilot-nature, and designed primarily to de-

*Fort Dodge Laboratories, Inc., Fort Dodge, Iowa.

termine whether a regional undertaking of this kind is practical. The survey indicates that a large scale survey of these diseases is feasible in 1958 and 1959, during which time the collection of 10,000 blood samples is anticipated. This should yield adequate data for statistical evaluation.

In continuing this program, an expansion of the leptospiral phase of the study must be incorporated to rule out the possibility of cross agglutination.[14] The inclusion of additional antigens such as *Leptospira grippotyphosa, Leptospira autumnalis, Leptospira ballum,* and other related serotypes would seem indicated for a more comprehensive study of this disease in wild deer.

SUMMARY

The need has been discussed for more information on those diseases transmissible from wildlife to domestic animals. In compliance with this necessity, a preliminary survey of the incidence of brucellosis and leptospirosis among the white-tailed deer of the Southeast has been conducted.

By plate-agglutination techniques, the results of this investigation indicate a prevalence of only 0.25 per cent brucellosis and 1.73 per cent leptospirosis among the animals surveyed. Continued studies on these diseases are anticipated in 1958 and 1959.

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Leptospira Hemolysin and Abortion

Investigations with various species of leptospiras showed that 2- to 3-week-old cultures of virulent strains of *L. pomona, L. grippotyphosa,* and *L. canicola* contained maximum quantities of a hemotoxin with a considerable lytic effect on erthrocytes of ruminant animals, whereas virulent strains of *L. icterohaemorrhagiae, L. hyos,* and *L. sejroe* had no such effect.

This hemotoxin, which is found in Leptospira-free filtrates of the cultures, is thermolabile. Its hemolytic action is hindered by the serum of normal adult animals but not by serums of newborn calves and pigs, or of fetuses of these species. Antibodies of immune serums of these species have a specific effect against this toxin. Large doses (150 to 220 ml.) of germ-free filtrates of the hemolytic Leptospira cultures caused dyspnea, hemoglobinuria, and death from lysis of erythrocytes in eight to 16 hours when injected intravenously into young lambs, but young dogs given the same dose showed no signs of illness.

With regard to the abortions associated with leptospirosis, in ruminants they were produced when these hemotoxins alone crossed the placenta and caused death of the fetus by lysis of its erythrocytes; whereas, in sows, the leptospiras invaded the fetuses and caused death and abortion. This indicates that Leptospira serotypes which are not able to produce hemotoxin can cause abortion only in sows.—*Kemenes Ferenc in Magyar allatorv. Lap. (June, 1958): 151.*

Leptospira Hyos in Aborting Sows.—Abortion in the late stages of pregnancy, and death of newborn pigs within one hour to five days, occurred in Hungary. Urine of affected sows contained *L. hyos* for six months and the sows had high antibody titer without showing illness. In the kid-

neys of the pigs, *L. hyos* was demonstrated by silver impregnation.—*Vet. Bull. (July, 1958): Item 2054.*

Leptospirosis in Pigs and Man

Leptospira pomona infection has been found in swine in all parts of the world but not in Britain. It is also absent from the mainland of Denmark although it is found on two adjoining islands where the organism is found in field mice which have not been found on the mainland.

In man, *L. pomona* was first isolated from a dairy worker in the village of Pomona in Queensland in 1937, and it was later found to be identical with the organism causing "swineherd's disease." In Switzerland, this disease occurs chiefly in the summer when the young swineherds wear no shoes while cleaning pig pens.

Leptospira mitis seems to be less virulent for swine than *L. pomona*. In man, it causes a disease known as "seven day fever."

Leptospira icterohaemorrhagiae was first isolated from swine in 1937, after a serious endemic of Weil's disease in man in western Samoa where this organism was found to be enzootic in Samoan pigs. The mortality for Weil's disease in Britain is about 15 per cent; of 418 cases, 31 per cent were in agricultural workers.

Leptospira canicola infection in swine was first described, in Georgia (U. S. A.) in 1953, in bathers in a creek to which infected animals had access. Three of the pigs had positive agglutination titers and the organism was recovered from the kidneys of 1. In an endemic in Edinburgh, in 1956, 61 per cent of 75 pigs in one herd and 40 per cent of 90 pigs in another had high agglutination titers. In man, the illness from *L. canicola* infection is less serious than that from *L. icterohaemorrhagiae* and is rarely fatal. The infection in man is often traced to handling affected dogs but the infection rate seems higher in persons that work with swine. Possible reasons for this are: (1) a greater tendency to wash the hands after handling a sick dog; (2) the greater number of leptospiras excreted in a pen of affected pigs; (3) the shorter survival of the organism in the more acid urine of the dogs; and (4) the wet condition of pig pens which allows the organisms to survive longer.—*J. Norval in Vet. Rec. (June 7, 1958): 470.*

Transmission of Leptospirosis by Sucking Arthropods.—None of the ticks, fleas, or lice collected from 215 gray rats, naturally affected with *Leptospira icterohaemorrhagiae*, carried leptospiras. The infection was transmitted to guinea pigs by some ticks. Leptospiras survived three days in one species of tick but not in two others. —*Vet. Bull. (July, 1958): Item 2058.*

Porcine Rhinitis Caused by Trichomonads.—Atrophic rhinitis was observed, in Russia, in 800 pigs from 2 months to 1 year old. Trichomonads were present on nasal swabs from these pigs but were not found on swabs from pigs on unaffected farms. Washings of nasal mucosa from affected pigs were used to experimentally infect the nose and vagina of laboratory animals. Guinea pigs aborted, five to six days after infection, and died.—*Vet. Bull. (June, 1958): Item 1744.*

Trichomonads in the Digestive Tracts and Nostrils of Pigs in Western United States.—Trichomonads were found in the stomachs of 10.2 per cent of 431 pigs, in the cecums of 72 per cent of 329, and in the nostrils of 56.3 per cent of 64. They were found concurrently in the stomachs and cecums of 8.2 per cent of 329 pigs, in the nostrils and cecums of 46.6 per cent of 58, and in the nostrils, stomachs, and cecums of 1.7 per cent of 58 pigs.—J. Parasitol., *43*, (1957): 695 (abstr. in *Vet. Bull. (June, 1958): Item 1745).*

The Site of Tick Paralysis.—Tick paralysis, induced in dogs by applying the wood tick *Dermacentor andersoni*, was found to be due to a failure of impulse transmission at the neuromuscular junction. Since animals recover quickly when the ticks are removed, the tick must secrete the toxin continuously.—*Nature (Jan. 11, 1958): 131.*

Another Systemic Parasiticide.—Dimethoate (Lederle Labs.) has demonstrated a marked efficiency in controlling nasal botflies that attack sheep. When compared with Trolene (Dow Chem. Co.) in U.S.D.A. tests, dimethoate was less effective than the latter in the control of cattle grubs but more effective in the control of the sheep botfly.—*J. Agric. and Food Chem. (July, 1958): 495.*

Brucella Bronchiseptica Vaccine for Rats

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A PREVIOUS REPORT indicated that oxytetracycline (Terramycin*) was an efficacious therapeutic agent for pneumonia caused by *Brucella bronchiseptica* in rats.[1] Frequent use of antibiotics for therapy interfered with experiments designed to determine the causes of dental caries, for which our rat colony is used. A more suitable approach was to develop a vaccine.

EXPERIMENTAL METHODS

The method of producing this vaccine followed closely the one used for producing pertussis vaccine by the Michigan Department of Health.[2] *Brucella bronchiseptica* was isolated from the lungs of rats showing typical signs of pneumonia and was grown on Bordet Gengou agar base (Difco) containing 0.1 per cent glycerin and 15 per cent defibrinated sheep blood. The organisms were removed after 24 hours' incubation at 37 C., washed once in saline solution, and killed by heating in a water bath at 60 C. for 20 minutes; 0.05 per cent formaldehyde was added to detoxify and preserve the vaccine.

The vaccine was standardized by turbidity measurement. The concentration of organisms before heat-killing gave a reading of 32 per cent light transmission at 530 $m\mu$, when the vaccine was diluted tenfold. The viable number of cells in the undiluted vaccine was 50 billion per milliliter. The vaccine was stored at least one month before being used, to insure adequate detoxification. Rats from our colony were used to test the toxicity of the vaccine. The vaccine was considered safe to use when 5 rats, 50 to 70 days old, survived a dose of 0.4 ml. given intraperitoneally.

Rats, 50 days old, were inoculated subcutaneously at weekly intervals with 0.1 ml., 0.15 ml., and 0.20 ml. of the vaccine, respectively. For the field trial, challenge test, and serological tests, all rats produced in our colony were included in this experiment. Two hundred rats were given three doses; 140 rats, the first two doses; and 60 rats, only the first dose of vaccine. There were 400 uninoculated control rats.

Serological Test.—Tube agglutination tests were carried out on rats given one, two, and three doses of vaccine, as well as on nonvaccinated rats. Twelve vaccinated and 12 nonvaccinated rats were tested one week and three months after the last inoculation. Titers of 1:256 to 1:1024 were obtained for the vaccinated rats, whereas no titer was observed for the control animals.

Challenge Test.—Rats given three inoculations and uninoculated controls were used. The inoculated rats were given 1 drop of an active culture of *Br. bronchiseptica* in each nostril, using a syringe with a 24-gauge needle. Three concentrations of cells were used for the challenge doses. The rats were observed for three weeks after infection. Only those that died showing typical signs of pneumonia, and from which *Br. bronchiseptica* could be isolated from the lungs, were tabulated (table 1).

TABLE 1—Results of a Challenge Test on Rats Inoculated with Brucella Bronchiseptica and on Nonvaccinated Controls

Infective dose (cells per ml.)	Control rats (nonvaccinated)	Vaccinated rats
10^{10}	7/19*	0/17
10^{9}	9/18	1/18
10^{8}	2/20	0/15

*Numerator = No. of deaths; denominator = No. of rats tested.

Nearly 50 per cent of the nonvaccinated rats given the two largest infective doses died, whereas only 1 of 35 vaccinated animals died.

Field Trial.—Rats not used in the challenge test were maintained in the colony. The same criteria used in the challenge test for establishing death by *Br. bronchiseptica* were used in the field trial (table 2).

The results of the field trial were not as striking as those of the challenge test. However, a total of 9 control rats died from

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*Terramycin is produced by Chas. Pfizer and Co., Inc., Brooklyn, N. Y.

TABLE 2—Results of a Field Trial on Rats Inoculated with Brucella Bronchiseptica and on Nonvaccinated Controls

No. of inoculations	Control rats (nonvaccinated)	Vaccinated rats
3	3/122*	1/122
2	4/80	1/80
1	2/45	0/45

*Numerator = No. of deaths; denominator = No. of animals observed.

pneumonia, compared with only 2 vaccinated rats.

DISCUSSION

The challenge test proved the vaccine to be effective. Field-trial data also indicated that the vaccine was effective. Although it would be more economical to give only one injection of vaccine, the results of the challenge test are based on three injections of vaccine. Subsequent challenge tests on animals given one or two doses of vaccine were not successful, due either to loss of virulence of the test organism or to increased resistance of the host.

To insure immunity for our highly inbred caries-resistant and caries-susceptible strains of rats, we give all rats in the colony three doses of vaccine. This disease is practically nonexistent in our vaccinated rats under 8 months old. A booster inoculation may be necessary for rats that are maintained over that age.

SUMMARY

A vaccine for *Brucella bronchiseptica* in rats has been prepared and tested. A colony has been protected against this enzootic disease by giving three inoculations to young rats.

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Jaagsiekte in Sheep in Italy.—Pulmonary adenomatosis in sheep associated with lungworm infection, and similar to Jaagsiekte, is reported for the first time in Italy.—*Vet. Bull. (July, 1958): Item 2218.*

Asian Type of Influenza A Virus in Horses.—Serological tests showed that 10 of 27 horses, in Holland, reacted with Asian type of influenza A virus. Intratracheal inoculation of a mouse-adapted strain of the Asian virus resulted in development of specific antibodies, thus the horse may be infected by natural exposure. Antibodies were not demonstrated in any of 124 swine serums examined.—*J. Versteeg et al. in Tijdschr. Diergeneesk. (July 15, 1958): 612.*

Eastern Equine Encephalomyelitis in Captive Pheasants.—This disease occurred 15 times in pheasants in Connecticut between 1951 and 1956. Artificial infection failed in wild birds other than pheasants. Feather-picking was an important means of transmitting the virus in pheasants; prevention of feather-picking by cutting the beaks or applying repellents was a valuable aid in controlling spread of the disease.—*Vet. Bull. (July, 1958): Items 2134 to 2138.*

Recovery in Experimental Rabies

It is possible to lengthen the incubation period and the duration of rabies in mice if they are vaccinated and then become paralyzed after intracerebral inoculation with virulent virus. The central nervous system is almost always autosterilized and this may result in a durable neuromuscular sequelae with functional impotence as in poliomyelitis. The resulting paralytic syndrome is actually rabic and it differs from the demyelinization due to antirabic treatment.

Rabies generally behaves in partially immunized animals like any other autosterilizable, neurotropic, disease from which recovery is possible, such as encephalitis and poliomyelitis.—*N. Constantinesco and N. Birzu in Ann. Inst. Pasteur, Paris (June, 1958): 739.*

Rabies in Nondomestic Animals.—Rabies has become a serious epizootic in Germany. It appeared ten years ago and has spread particularly among animals of the forest. The fox seems to be the main reservoir. Field mice are considered latent virus carriers. Negri bodies were found in 1 of 390 normally hunted deer. The possibility that blood-sucking ectoparasites and insects can transmit the infection is being considered.

Rabies has been reported in 28 birds, of which half were domestic fowl and half free-living birds.—*H. Pitzschke in Monatsh. f. Vet.-med. (July 15, 1958): 417.*

Surgery and Obstetrics
and Problems of Breeding

Abomasal Ulcers in Cattle—Recovery of One Cow After Surgery

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ULCERATION of the bovine abomasum is a condition that is being seen more and more frequently in large animal practice. Ulcers in this organ occasionally are seen on necropsy of animals dying of some other primary condition, suggesting that this lesion may be secondary. Scars indicate that ulcers have occurred, were misdiagnosed, or did not cause illness and healed spontaneously. The most serious types of ulcers are those which erode so deeply that they cause severe or fatal hemorrhage, due to involvement of a large blood vessel, and those which perforate the abomasal wall and cause fatal peritonitis.

The purpose of this paper is to describe several cases of abomasal ulcers recently seen in the ambulatory clinic of the New York State Veterinary College. One animal, in which ulcers were diagnosed clinically, recovered following surgical treatment.

REVIEW OF THE LITERATURE

The literature on this subject is sparse and recent. In 1955, there were reports on 1 animal that died of peritonitis following perforation of an abomasal ulcer;[4] on 3 cases of perforating gastric ulcer in adult cattle;[4] and on an interesting case with localized peritonitis and prolonged clinical illness in an adult cow.[7]

The death of a cow due to hemorrhage from an abomasal ulcer was reported in 1956.[2] This cow had been fresh five days and showed signs of acetonemia. She did not respond to treatment with cortisone and was re-treated, three days later, by autogenous hemotherapy. The following day, she staggered, collapsed, and died while on the way in from pasture. On necropsy, the abomasum was distended with fluid and blood. There were many small and two large ulcers in the mucosa, one 3 by 6 inches and the other 2 inches in diameter. These areas appeared to be the site of the hemorrhage.

Successful abomasotomy in an adult ox was reported in 1950.[3] In 1953,[5] this operation was recommended for impaction of the abomasum in calves.

CASE REPORTS

Case 1.—A 6-year-old Guernsey cow calved normally. Twenty-four hours later, she was off feed, weak, and depressed. The body temperature was 101.5 F., the pulse rate 130 per minute. A perforating abomasal ulcer was one of several possible diagnoses considered.

The cow was treated with antibiotics intramuscularly, and dextrose, calcium, and magnesium intravenously, but died the second day after calving. On necropsy, there was much free ingesta in the peritoneal cavity. The abomasum communicated, through a perforation, with a connective tissue pocket formed outside the wall of this organ, and a hole in the pocket had allowed passage of ingesta into the peritoneal cavity.

Case 2.—A 7-year-old Holstein-Friesian cow, that had been slightly anoretic for two days, became worse, could rise only with difficulty, and knuckled over on the left hind fetlock for about ten minutes after she did rise. The cow, which had been purchased about eight months previously, was in advanced pregnancy but her udder did not show preparation for parturition. When examined late that day, the cow was unable to rise and seemed to have little control over the left hindlimb.

The body temperature was 100 F., heart rate 125, and respiratory rate 32. The pulse was imperceptible and the jugular veins could not be distended for venipuncture. There was no rumen activity and the feces were watery. The entire body had a cold and "clammy" feeling. Rectal palpation revealed that the 8-month fetus was apparently dead. The middle uterine arteries did not possess their normal fremitus. The cervix was closed and a normal amount of clear mucus was present in the vagina.

The cow was treated with calcium gluconate and antihistamines subcutaneously, antibiotics intramuscularly, and antihistamines and gastric antacids orally, but

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soon developed an expiratory groan, open-mouthed breathing, and died within an hour.

On necropsy, there was severe diffuse peritonitis, much ingesta scattered throughout the peritoneal cavity, and a perforating ulcer in the abomasal wall approximately 2 inches in diameter. This case occurred in the same herd of high producing cattle as the case described in 1956.[1]

Case 3.—This Holstein-Friesian cow, 14 years old, had been fresh one month and had not eaten properly since calving. For two or three weeks, the cow had showed ketonuria and, on the day of death, it had been treated for hypocalcemia. Before death, there were nervous signs, including contraction and flexion of the forelimbs, trembling of the triceps, and nystagmus.

At necropsy, the blood was watery, indicating anemia, and the abomasum contained many large blood clots. Several scars in the abomasal mucosa appeared to be healed ulcers and many areas, from 0.25 cm. in diameter to 5.0 cm. in length, in one area, along the edge of one fold, were denuded and inflamed, and appeared to be the site of hemorrhage.

Case 4.—This Holstein-Friesian cow, 7 years old, had developed slight anorexia and had dropped in milk production. A few hours later, she had a profuse, watery diarrhea. Her body temperature was 101.2 F., pulse rate 150, respiratory rate 50, and the mucous membranes were pale.

The next day, the feces were dark and sticky and were positive when tested for hemoglobin. The blood hemoglobin level was 4 Gm. per 100 ml. (normal, 8.0 to 14.5 Gm./100 ml.). During the next four days, the cow was given 3 gal. of blood, plus liberal quantities of saline, dextrose, and calcium gluconate solutions intravenously. The hemoglobin fell to 2 Gm. per 100 ml. of blood and the cow was unable to rise the last three days of illness.

After death, on the sixth day of illness, several scars, that represented healed ulcers, were found in the mucosa of the abomasum. Two ulcers appeared to be the site of hemorrhage.

Case 5.—This 5-year-old Guernsey cow had been fresh three weeks when she began to do poorly and suffered from a poor appetite, decreased rumen motility, and ketonuria. She seemed to be nervous while being examined.

She was treated for ketosis at this time, and again two days and four days later, but showed little improvement. When again examined, two weeks after the initial examination, the feces were dark, the mucous membranes pale, the pulse 138, and the body temperature was normal. The next day, the heart rate was 148 and the heart sounds were loud. The hemoglobin reading was 4.3 Gm. per 100 ml. of blood. The hemoglobin test on the feces was positive.

The cow was tranfused with 14 qt. of blood in the next five days. Her condition improved slightly and she ate a little hay and grain each day. Three weeks after the initial examination, it was decided to operate and look for the suspected abomasal ulcer.

Surgical Procedure.—The cow was given a moderate dose of a tranquilizer intravenously and cast in left lateral recumbency. The right paracostal area was clipped, washed, and disinfected. The line of the proposed incision was infiltrated with 2 per cent procaine.

An incision was made through the abdominal wall parallel to the costal arch and extending, from a point 8 inches from the midline, caudodorsally for 12 inches. The pyloric region of the abomasum was brought to the incision, packed off with sterile towels, and incised. Free clots of blood were present in the lumen and there was an ulcerated area, 6 inches long, on the free edge of one of the mucosal folds. These folds are in the fundus of the organ and, because of the location of the abomasal incision, it was impossible to exteriorize this area. Therefore, this incision was closed with an orthodox intestinal-type suture, the laparotomy incision was extended ventromedially, and the fundus of the abomasum was brought to the opening.

A 7-inch incision was then made in the fundus and the affected plica was easily exteriorized. The ulcer described was the only one found. A series of overlapping staple-type sutures of catgut was placed in the affected abomasal fold just outside the perimeter of the ulcer and extending from one edge of the fold to the free edge on the other side of the ulcer, to stop the hemorrhage and cause the affected area to slough at the suture line.

The abomasum was closed as before and the laparotomy incision was closed with catgut in the peritoneum and transversus muscle, and with umbilical tape in the oblique muscles and in the skin. The wound

healed satisfactorily and the skin sutures were removed in 14 days.

Results.—For four days after surgery, the hemoglobin value remained below 4 Gm. per 100 ml. of blood. During this time, the cow was given 16 qt. of blood, a systemic clotting agent, and intramuscular injections of an iron compound. On the fifth postoperative day, the hemoglobin began to rise, the appetite and condition of the cow gradually improved and, by the tenth day, milk production was normal. Five months later, the cow was still healthy and normal.

Discussion

There apparently is an increased occurrence of abomasal ulcers in dairy cattle for which effective surgical treatment seems possible. While the case described does not necessarily make this procedure rational, it does indicate that it is possible. As indicated in cases 4 and 5, repeated blood transfusion alone may not be adequate to save the patient's life. It is hoped that others will attempt surgical treatment in cases of chronic abomasal hemorrhage, and even for perforating abomasal ulcers, so that this procedure can be further perfected and evaluated.

The cause of abomasal ulcers in the cow is unknown. It has been shown experimentally,[5] and many have believed, that ulcers in the digestive tract of some animals are directly related to the acidity of the chyme. If this is true, we need only to find out why the hyperacidity exists in the cow in order to understand the cause.

In the cases described, 3 of the 5 cows were in the first month of lactation, 1 was dry, and the lactation stage of the other was unknown. Three had ketonuria and had been treated repeatedly for ketosis. All were dairy cows.

It is well known that parturition and early heavy lactation represent a severe stress to the dairy cow's metabolism. It is also known that stress causes an increased blood level of corticosteroids and that increased corticosteroids stimulate gastric secretion.[4] With increased gastric secretion, there may be increased gastric acidity. The stress of advanced pregnancy and parturition, of high production, and of a diet containing a high proportion of concentrates may stimulate increased gastric acidity via this humoral mechanism. Even the character of the diet may directly influence gastric acidity by its action in stimulating gastric secretion.

In case 5, the cow was noticed to be nervous throughout the course of illness, but this disappeared after recovery. This psychological state may be a cause of hyperacidity in the ox as it appears to be in man. It is probable that there is a variety of predisposing conditions or causes of abomasal ulcers in the cow and that no one factor can explain the occurrence of all ulcers.

The syndrome seen in animals with gastric ulcers varies with the lesion. In most cases, there is a period of mild, nonspecific signs of illness which may last for a few hours or several days. This represents the period from the time the mucosa is worn away to the time that it heals or until a more serious structure—the peritoneum or a large blood vessel—is affected.

When the erosion of the serosa occurs, if large quantities of ingesta escape, resulting in acute, diffuse peritonitis, this is manifested by severe depression, subnormal temperature, cold extremities, fast pulse, prostration, and death. However, if there is only a small perforation and little ingesta escapes, there is a localization of the peritonitis to the area involved, with no immediate, overwhelming toxemia or shock syndrome.

When the peritonitis can be localized, the syndrome simulates reticulitis of traumatic origin, and it may even respond to symptomatic and antibiotic therapy. In more severe, prolonged cases, the adhesions and the localized infection are sufficient to impair the health of the animal and progressive emaciation results.

When, instead of erosion of the serosa, there is erosion of a large blood vessel, the hemorrhage may cause death in a few hours.[1] If a somewhat smaller vessel is eroded, there will be a chronic blood loss, sufficient to cause illness but not immediate death. Such cases are characterized by dark, tar-colored feces (often of normal consistency), a fast pulse rate, pale mucous membranes, and an increased respiratory rate. Laboratory examination of the feces will show significant amounts of hemoglobin, and hematological examination will substantiate the clinical observation of severe anemia.

The diagnosis of abomasal ulcer is always difficult and can be definite only when the ulcer is demonstrated. A presumptive

diagnosis may be made when the patient shows a severe anemia and the presence of occult blood in the feces. Salmonellosis and coccidiosis also are characterized by blood in the feces but, in these diseases, there is frank, red blood that has obviously originated close to the rectum, and diarrhea is usually present. The acute diffuse peritonitis following erosion of the serosa may be confused with any other disease that is characterized by a severe bacteremia or toxemia. Peracute traumatic peritonitis, toxic indigestion, and heavy metal poisoning are manifested by a similar syndrome.

Prophylaxis, the most rational way of combatting disease, must be based on an understanding of the etiological factors. In the case of gastric ulcers in the ox, the causes are not known and, therefore, no rational prevention program can be recommended.

Rational treatment must be based on an accurate diagnosis, which is impossible in the early stages of this condition. When the disease has progressed to the stage where there are signs of peritonitis or severe blood loss, it is doubtful that there is any medical treatment of value. It would seem that the only rational approach to a problem of this sort is an exploratory laparotomy. If perforation has occurred, there would be a challenge to attempt a closure of the opening and to treat the peritonitis. If hemorrhage is occurring from an ulcer, surgical correction should be attempted if blood transfusions and other supportive therapy fail.

SUMMARY

1) Five cases of abomasal ulcers in adult cattle are described. In 2 cases, perforation of the abomasal wall resulted in fatal peritonitis; in 3 cases, erosion of a large blood vessel resulted in severe hemorrhage into the digestive tract.

2) Symptomatic treatment of 2 animals with hemorrhagic gastric ulcers was unsuccessful.

3) Surgical treatment of 1 animal with a hemorrhagic gastric ulcer was apparently successful. The operation is described.

4) The etiology, signs, and treatment of this condition are discussed.

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A Steer with a Perforated Abomasum

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JOHN W. CAREY, D.V.M.

West Liberty, Iowa

On June 2, 1958, we were called to determine the cause of death of a 1,000-lb. steer in a feedlot. Ten days previously, the cattle had stampeded, when frightened, and had broken through a gate. For the past two days, this steer had moved rather slowly but had eaten a small amount of feed when driven to the feed bunk. Two hours before he was found dead, in a shed, he had seemed no different than in the previous days.

At necropsy, there was no evidence of an injury to the abdominal wall. An extensive peritonitis was found, with a pronounced thickening of the omentum. In the wall of the abomasum, there was a perforation about 2 cm. in diameter, through which ingesta had been exuding for some time. The abomasum was opened and the hole in the mucosa was found to be about the size of a fifty cent piece (3 cm.). The edges of the mucosa were turned in and were healed, but the adjacent area was slightly inflamed.

Whether the perforation was the result of an external injury or of an ulcer in the mucosa was problematical. No foreign bodies were found in the reticulum or elsewhere. There was no evidence of external trauma in the abdominal wall.

Drs. James C. and John W. Carey are general practitioners in West Liberty, Iowa.

Simple Procedure for Correction of Torsion of the Abomasum

A pregnant Holstein-Friesian cow from a herd having a high incidence of traumatic gastritis became ill. The tentative diagnosis was traumatic gastritis.

She was confined on an inclined platform for two days but failed to improve. A more thorough examination disclosed torsion of the abomasum.

With the assistance of several neighbors, the cow was cast and turned on her back. She was slowly rocked from side to side through an arc of 60 degrees. After five minutes of this procedure, she was allowed to stand and promptly began to eat. She remained free of clinical signs of disease. —*Arthur Lipman, D.V.M., Putnam, Conn.*

Bilateral Glaucoma in the Cat

M. C. COOP, D.V.M., and J. R. THOMAS, M.D.

Houston, Texas

On Sept. 9, 1954, a 3-year-old Siamese seal-point castrated male cat was treated for a slight abrasion of the left cornea. Penicillin eye drops, hot compresses, and foreign protein therapy were administered and recovery was complete within three days.

On Feb. 2, 1955, the cat again had an abrasion, this time on the right cornea. The same treatment was repeated, and the cat recovered.

On April 2, 1955, when next seen, both eyes had become enlarged and the condition was considered a primary bilateral glaucoma (which later, on necropsy, proved to be secondary). Various drugs were tried, including pilocarpine, physostigmine, and injectable vitamin A.

On Dec. 9, 1955, the cornea of the right eye had become cloudy and the eye enlarged (fig. 1).

On Nov. 27, 1956, both eyes had become so enlarged that the lids could not be brought into apposition (fig. 2). The cat slept with its forelegs folded across its eyes.

On Dec. 12, 1956, the cat was euthanatized for necropsy.*

PATHOLOGICAL CHANGES

Pathological changes, except for those in the eyes, were minor; the right lung was partially atelectatic and both lungs showed focal emphysema. The renal cortices were pale and one mesenteric lymph node was enlarged.

The eyes were similarly affected, each anterior chamber containing a pink, creamy, soft material. Bacteriological and tissue cultures showed no growth. Microscopically, sections of the eyes demonstrated inflammatory changes in the anterior portions of the uveal tracts; spe-

Fig. 1 (left)—Head of a cat showing bilateral glaucoma; notice the cloudy cornea of the right eye.
Fig. 2 (right)—Eleven months later, the glaucomatous eyes had enlarged until they could not be closed.

Dr. Coop is a small animal practitioner in Houston, and Dr. Thomas is a specialist in eye pathology, Baylor University, Houston, Texas.

*At the Pathology Department, Baylor University, College of Medicine, Houston, Texas.

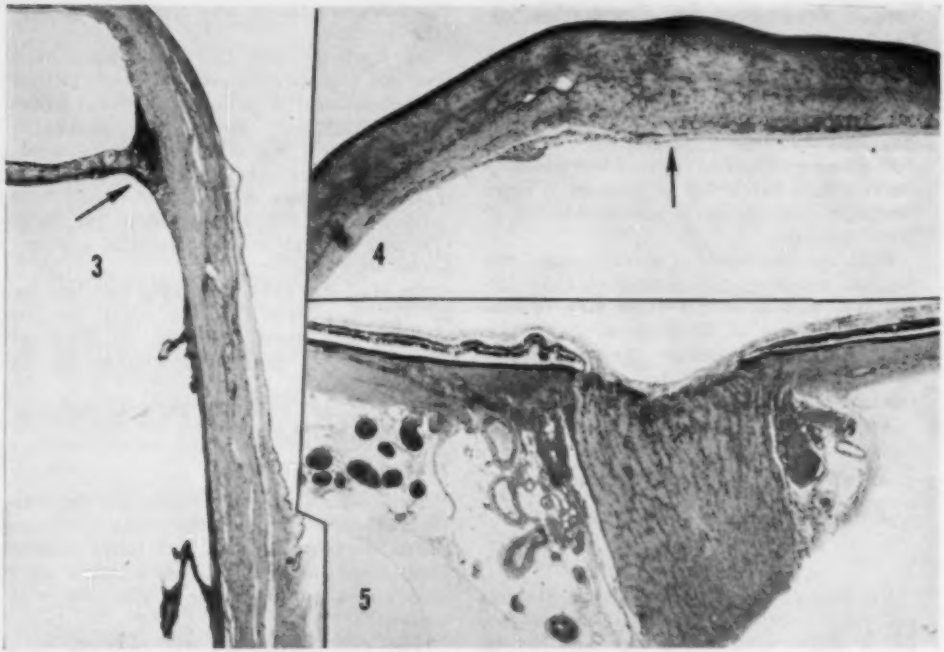

Fig. 3—Histological section of the cornea of a cat, showing the iris root synechia (arrow) and infiltration of inflammatory cells. The ciliary body, which is poorly developed in the cat, has probably undergone some degeneration.

Fig. 4—Histological section of the thickened cornea showing fibrosis (keratosis) (arrow) and cellular infiltration.

Fig. 5—Histological section through the retina and optic nerve, showing the depression of "cupping" of the optic papilla (or disc) and lamina cribrosa, due to pressure.

cifically in the iris ciliary bodies. Here there was lymphocytic and neutrophilic infiltration, the latter extending into the anterior chamber. The corneas were vascularized and scarred as the result of inflammation and distention.

Synechia of the roots of the irides, plus inflammatory exudate into the angles of the anterior chambers (fig. 3), caused the glaucoma.

The corneal vascularization and inflammatory cell infiltration, as well as scarring (fig. 4), was the result of increased intraocular pressure from the glaucoma, decreased aqueous circulation, and reduced nutrition of the corneal tissues. A toxic inflammatory exudate in the anterior chamber and an exposure keratitis due to the buphthalmos had developed.

The posterior cupping of the optic disc and lamina cribrosa at the nerve head (fig. 5) was also a manifestation of glaucoma.

Sections of the mesenteric lymph node demonstrated an inflammatory cell exudate similar to that found in the eyes.

SUMMARY

A 3-year-old castrated male cat showed a nonspecific inflammatory reaction in a mesenteric lymph node, plus bilateral nonspecific iridocyclitis and secondary glaucoma.

Surgical Treatment of Colic in the Mare.—Three cases are reported in which vaginotomies were performed in the successful manipulation treatment of colic in mares. Two cases involved a malposition of the small colon and one of the pelvic colon. The operations were performed with the patient standing. There were no complications although 1 mare developed a fever.—*H. Brehmer and M. Liesengang in Monatsh. f. Vet.—med. (July 1, 1958)*: 405.

Esophageal Rupture in a Standardbred Mare

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Philadelphia, Pennsylvania

ON JAN. 28, 1958, a 23-year-old Standardbred mare was brought to the University clinic, with visual evidence of food and saliva escaping from the lower cervical region. The previous day, the attendant had noticed that the mare was not eating and had a large swelling in the neck region. The local veterinarian, after a test puncture, made a diagnosis of a rupture of the esophagus.

The mare was due to foal in two months. Since she had a fever, she was given penicillin and dihydrostreptomycin and referred to our clinic.

At the time of admission, a small opening approximately 1 cm. in diameter was evident on the ventral midline, lower cervical region, from which food and saliva escaped. The temperature was 99.4 F., pulse 36, respiration 16, and general condition fair, with clinical evidence of mild dehydration. The tissues surrounding the fistula were swollen, with considerable edema extending to the pectoral region.

The initial therapy consisted of a commercial preparation containing amino acids and dextrose, given intravenously; antibiotics and tetanus antitoxin, given intramuscularly; and water via a stomach tube.

SURGICAL PROCEDURE

After the introduction of a local anesthetic, the esophagus was exposed with a 9-inch incision of the skin and was freed from its surrounding attachments so it could be withdrawn for complete examination. Approximately 1 qt. of masticated food and saliva was removed from the surrounding tissues, including the muscles, jugular vein, and carotid artery. A considerable quantity had gravitated distally toward the sternum.

Following removal of the food, two longitudinal lacerations, approximately 3 cm. in length, were found directly opposite each other in the dorsal and ventral surfaces of the esophageal wall. The margins of the lacerations were clean.

From the Department of Veterinary Surgery, School of Veterinary Medicine, University of Pennsylvania, Philadelphia.

Since the prognosis was poor, it was decided to direct all therapy toward maintaining the mare until she foaled. Allis tissue forceps were attached to the margins of the ventral opening and used to retract the tissues to expose the dorsal opening, which was sutured with a continuous through-and-through suture applied from the luminal surface, using No. 00 silk with an atraumatic needle.

No attempt was made to suture the ventral wall—it was decided that this could be attempted later as a second stage of the repair. The wound was flushed with sterile saline solution and all pockets which might collect food and saliva were eliminated.

POSTSURGICAL CARE AND PROGRESS

The mare was cross-tied in a box stall. To maintain electrolyte balance, all escaping saliva was collected and mixed with the ration to be hand fed. The initial apparatus devised to collect the saliva consisted of a polyethylene bag suspended below the opening into the esophagus by a length of gauze folded to four-ply thickness and 4½ inches wide, which was secured to the edges of the bag and passed over the top of the mare's neck. The opening into the bag was maintained by a large embroidery hoop. A hole was made in the bottom of the bag, to which was attached a short piece of a large-bore stomach tube to conduct the swallowed saliva to a collecting bucket.

An interesting observation was that 20 to 24 qt. of saliva could be collected in 24 hours without the mare having access to hay, grain, or water.

The diet consisted of 1 qt. of fine ground oats, 1 pt. of fine alfalfa leaf meal, 1 pt. of powdered milk supplement fortified with vitamins (a commercial calf starter), 1 pt. of wheat bran, and 1 tbs. of salt. Added to this concentrate mixture was 6 to 10 qt. of saliva and sufficient water to bring it to a fluid consistency which would pass through a stomach tube with an inside diameter of 0.5 inch.

This mixture was fed by gravity, four times daily, with the stomach tube inserted through the laceration in the esophagus. Not more than 30 qt. was given at one

Fig. 1—Mare with ruptured esophagus, shown two weeks after admission to the clinic. The bucket suspended from the neck collected the masticated roughage.

feeding. A standard vitamin and mineral supplement was added once daily.

Antibiotics were given for five days. Hemogram and total serum protein determinations were made frequently and at no time did they change significantly.

The general condition of the mare gradually improved and she gained weight (fig. 1, 4). The wound began to granulate rapidly after the seventh day (fig. 2). The feces remained essentially normal. The mare was exercised by "walking-in-hand" three times daily. The sutures in the dorsal wall of the esophagus failed to hold and were shed on the sixth day. It was decided to wait until after the mare foaled, then attempt to repair the esophagus by removing the lacerated area and replacing it with an aortic or esophageal transplant.

At the end of the second week of hospitalization, the mare was given free access to alfalfa hay. The polyethylene bag was replaced with a suspended bucket (fig. 1) and the masticated hay collected as it escaped through the fistula. In this manner, 10 to 15 lb. of the masticated hay could be given daily via stomach tube, along with the concentrate, saliva, and water. The mare was turned loose in her stall at night.

At the end of the eighth week, it was no longer possible to pass the stomach tube through the incision without causing trauma and distress. Due to the reduced size of the wound, it was decided to allow the mare access to hay, grain, and water. Only a small amount of food and water escaped from the wound and the mare continued to progress normally.

On April 4, 67 days after the rupture was detected, the mare foaled a healthy filly (fig. 4) unassisted. For three days previous to foaling, there was no evidence of food or water escaping from the esophagus, and healing of the skin was complete (fig. 3). The mare was discharged to be rebred at the ninth-day estrus.

DISCUSSION AND CONCLUSION

The above report is of interest for several reasons. Rupture of the esophagus in the

Fig. 2—The lesion in the lower cervical region of the mare as it appeared at the fourth week.

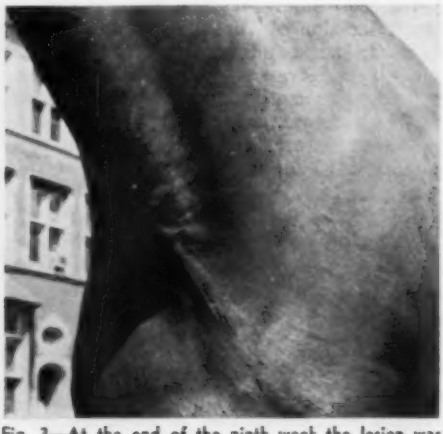

Fig. 3—At the end of the ninth week the lesion was completely healed.

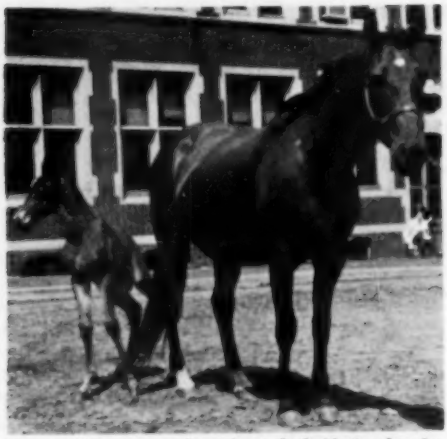

Fig. 4—The mare and newborn foal. Notice her improved condition as compared with seven weeks earlier (fig. 1).

horse is rare. The etiological factor in this case is unknown, but one would suspect trauma from a sharp object. The diet the mare could consume appeared to be adequate for her to gain weight and improve in condition.

In spite of the known poor healing qualities of wounds of the esophagus, the wound in this case healed rapidly and completely by granulation, without resorting to extensive surgical repair. It will be of interest to follow this case to determine if a stenosis of the esophagus develops from the natural healing process.

ADDENDUM

Personal communication with the referring veterinarian revealed that the mare has continued to do well, with no evidence of difficulty in the normal eating habits. The mare has consumed grain, hay, and grass in a normal fashion. The foal was reported to be in perfect condition.

Pregnancy Test of Mares Bred to a Jack or Stallion.—Rabbits treated with serum of mares 55 to 130 days pregnant to a jack always showed a false negative Friedman reaction, whereas the same test with serum of a mare pregnant to a stallion was always positive. In female donkeys pregnant to a stallion, 25 per cent similar tests were negative.—*O. Oliva in Atti Soc. ital. sci. vet. (Sept., 1957)*: 448.

A Barbiturate Antagonist for Calves

One of the outstanding variations in the pattern of anesthesia produced by barbiturates is seen in calves where the so-called "short-acting" barbiturates often produce prolonged anesthesia. A study was conducted to determine the antibarbiturate activity of 3,3-methylethyl glutarimide when used in calves.

Matched pairs of calves were anesthetized with a barbiturate and maintained in surgical anesthesia for 15 to 20 minutes. One from each pair was given from 90 to 100 mg. of the antagonist per kilogram of body weight. Anesthesia in the treated calves was terminated within a few minutes and they were able to stand unaided. Control calves slowly regained consciousness over a period of several hours and were unable to stand even after 20 hours. —*S. Jennings in Vet. Rec. (June 14, 1958)*: 494.

Undescended Testes.—A study of 209 human patients with undescended testes shows the importance of assessing the initial position of the testes in the choice of treatment. Following treatment with chorionic gonadotrophin, the testicles descended in 60 per cent of selected patients, with no evidence of permanent damage to the seminiferous tubules. Orchiopexy is necessary when there is a mechanical defect. The optimum age for treatment is 9 or 10 years. Of 24 patients with repaired bilateral cryptorchidism, 70 per cent were fertile ten years after treatment.—*Brit. Med. J. (June 14, 1958)*: 1371.

Brucella Infection and Sexual Rest

When 10 ewes were artificially infected with *Brucella melitensis* after six months of sexual rest, all became pregnant. The first 7 produced normal lambs and, when slaughtered one month later, cultures from their lymph nodes and organs were all negative for Brucella. The other 3 were still normally pregnant.—*P. Biggi in Atti Soc. ital. sci. vet. (Sept., 1957)*: 808.

[This recalls an old statement to the effect that *Br. abortus* infected only a *pregnant* uterus or a *milking* udder. Only the summary of the above article was published and it does not state whether these ewes had previously been pregnant.]—ED.

Clinical Data

Abortion in Sheep Due to a Virus of the Psittacosis-Lymphogranuloma Group

STUART YOUNG, M.S., M.R.C.V.S., D.V.S.M.; HAZEL PARKER, M.A.; B. D. FIREHAMMER, M.S.

Bozeman, Montana

VIRUS ABORTION was first described in sheep in Scotland in 1950.[13] Considerable evidence has been presented that the viral agent responsible for the disease in that country belongs to the psittacosis-lymphogranuloma group. Developmental forms of the virus on the chorioallantoic membrane of embryonating eggs have been compared[14] with forms that occur in the developmental cycle of psittacosis virus. It has been shown serologically[2,10] that the above virus possesses the heat-stable antigen of the psittacosis-lymphogranuloma group, and that its chemotherapeutic response to various antibiotics indicates its membership in this group.[3]

Since 1950, virus abortions in sheep have been described in Sardinia,[12] in Germany,[9] and in France.[6] Complement-fixing antibodies of the psittacosis group were found in the serum of infected sheep in Germany and France.

This report describes abortions in sheep in two flocks in Montana from which a virus has been isolated, and in two other flocks in which evidence of a viral infection has been found. Serological studies indicate that the virus is a member of the psittacosis-lymphogranuloma group.

FIELD OBSERVATIONS

Flock A.—This band of sheep, on a ranch in the Yellowstone River area in Montana, had no imported sheep since 1955, when a group of yearling ewes was brought in. There were no abortions in 1956.

Of the 1,280 breeding ewes in 1957, 150 to 175 aborted in the final month of pregnancy, but no laboratory investigations were undertaken.

In the 1958 lambing season, there were 1,240 breeding ewes due to start lambing on April 10. Abortions started in late February and continued at a regular rate until 50 ewes had aborted. No abortions occurred after normal lambing began.

Some of the ewes were ill for several days before aborting, and most of them were ill for several days afterward. Some ewes retained their fetal membranes, and many showed a vulval discharge that was often blood-tinged or thickly mucoid. Two ewes died following abortion, but were not necropsied. Of the aborting ewes, 25 later accepted orphan lambs, and these lambs progressed well.

From this flock, 14 aborted fetuses and six fetal membranes were examined. The fetuses varied in size from 9½ to 16 inches in length and were woolless or showed only early wool growth. Of the 14 fetuses, 12 showed some gross pathological changes, the most common being a blood-tinged subcutaneous edema of the abdominal wall. This was usually accompanied by a variable amount of blood-tinged serous fluid in the body cavities.

In 3 fetuses, the internal organs were noticeably softened and friable. The livers were sometimes enlarged and often pale but, in 1 lamb, the liver was dark brown and showed superficial areas of hemorrhage. Some of the fetal membranes showed no abnormality, while others were slightly edematous, with markedly pale and shrunken cotyledons.

Flock B.—This was a farm flock of 36 breeding ewes, 1 to 3 years old, on irrigated pasture land in the upper Yellowstone River Valley. Lambing was due to commence May 1, 1958. From April 13 to 25, 3 ewes aborted and 1 had a weak lamb that died in a few hours. Two other ewes aborted by May 2, and a mummified fetus was removed surgically from a ewe because of dystocia on May 12—a total of 7 aborted or nonviable lambs, mostly from 1-year-old ewes.

Three of the 4 fetuses examined were full-size and appeared to be fully developed. The fetus delivered by cesarotomy, though of full-size, showed some subcutaneous edema of the abdominal wall and a mummified appearance of the internal organs. The

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The authors acknowledge the serological examinations performed by Dr. D. B. Lackman, Rocky Mountain Laboratory, U.S. Public Health Service, Hamilton, Mont.

fetal membrane from this ewe was markedly changed in appearance, showing considerable edematous thickening and a distinctly gray color. Of the other two fetal membranes examined, one showed this gray color while the third was normal grossly.

Flock C.—This flock, with no previous history of abortion, was composed of two range bands of ewes due to start lambing April 5, 1958. The larger band of 1,500 mature ewes suffered no abortions. In the smaller band, including 500 yearling and 250 mature ewes, the first abortion occurred on March 26, with 14 ewes aborting in the next five days. The majority of these abortions occurred in yearling ewes.

Two aborted fetuses and their membranes were examined; no gross abnormalities were found.

Flock D.—In 1952, a severe outbreak of vibrionic abortion occurred in this Idaho flock. Until 1958, vibriosis had not again been diagnosed and significant abortions had not occurred.

The flock was divided into two bands of approximately 1,300 breeding ewes each, with expected lambing dates of March 31 and April 18, respectively. By lambing time in the earlier band, 50 abortions had occurred, and abortions had started in the later band. The bands had wintered in the same area, but were separated after the first abortions occurred.

Vibriosis was diagnosed by demonstration of Vibrio-like organisms in stained smears of fetal stomach contents and isolation of *Vibrio fetus* in cultures of this material. A number of aborted lambs showed typical liver lesions of vibriosis.

One fetus intact within its membranes, 2 other fetuses, and smears from the fetal cotyledons of 2 others were examined in the laboratory. The fetus which was within its membrane was apparently at full-term. It showed no edema or fluid accumulations in the body cavities and no liver lesions. One other fetus, also fully grown, showed considerable blood-tinged edema of the abdominal wall, much blood-tinged fluid in the body cavities, and a friable liver. The third fetus was smaller and showed no edema or fluid accumulations, but its liver showed typical lesions of vibriosis.

Laboratory Examinations

Smears from Fetal Cotyledons.—In examining each fetal membrane, smears were prepared from several cotyledons and stained by the Gram method and the modified Ziehl-Neelsen method.[12] Some smears were also stained by the method of Machiavello.

Large numbers of minute bodies were observed in smears stained either by the modified Ziehl-Neelsen method or by the Machiavello method. They were not readily demonstrated by the Gram-staining method. The majority of the bodies were stained red though, in some smears, a minority of them stained blue.

These organisms were estimated to be less than 0.5 μ in size and were typically coccoid. They occurred singly or in clusters and, frequently, the clusters were intracellular. Under dark-field illumination, they assumed a bright pale green color. In size, morphology, distribution, and staining affinity, these organisms were identical with the elementary bodies first described in ovine fetal membranes.[13,14]

These elementary bodies were observed in smears from nine fetal membranes from flocks A, B, and C, and in 1 from flock D. Smears of the other two membranes from flock D showed the presence of vibrios only.

Bacteriological Cultures.—Bacteriological cultures were made of the cotyledons of every fetal membrane and of the fetal stomach contents of every fetus examined. In addition, cultures were made from the fetal heart blood, liver, brain, lungs, and thoracic fluid.

Cultures were routinely made in a semisolid medium prepared from Albimi Brucella broth to which had been added 0.15 per cent agar. Plate cultures were also made using Difco blood-agar base and 5 per cent defibrinated rabbit blood. The semisolid and plate cultures were incubated in sealed jars from which air had been evacuated to leave a pressure of 12 inches of mercury. Other cultures were made in selenite broth, incubated for 24 hours in air, and then transferred to Difco SS agar plates which were also incubated in air.

Cultures of fetal tissues, stomach contents, and fetal membranes did not result in the demonstration or isolation of any bacterial pathogen, except in 3 fetuses.

One of these fetuses, from flock A, showed no gross pathological changes other than a dark brown liver with superficial hemorrhages. From the stomach contents of this fetus, a Vibrio was isolated which produced hydrogen sulfide but not catalase. When inoculated in Difco thiol semisolid medium (0.5 per cent agar) by stabbing, growth occurred along the stab as well as on the surface. Therefore, the organism was not considered to be *V. fetus*.

No vibrios were observed in Gram-stained smears of the fetal stomach con-

tents, or of the fetal membranes which appeared to be normal. No smears of the membrane were stained by the modified Ziehl-Neelsen method.

In the 2 fetuses from flock D which showed pathological changes, vibrios were demonstrated in stained smears of the stomach contents and identified as *V. fetus* in cultures of this material and other tissues. No vibrios were observed or isolated from the third fetus from this flock.

Cultures in Embryonating Eggs.—Fetal membranes and tissues, for inoculation into embryonating eggs, were collected aseptically and stored at −35 C. Tissue suspensions were prepared by grinding and dilution with broth. Where contamination of the tissues was thought to have occurred, an equal amount of an antibiotic solution was added to the tissue suspension and the mixture incubated for 30 minutes at 37 C. before inoculation. The antibiotic solution was one known as T.S.S.,[1] containing tyrothricin, sodium sulfadiazine, and streptomycin hydrochloride.

Tissue suspensions were inoculated into 5- to 7-day-old embryonating eggs by the yolk sac route. In those in which virus infection was established, the embryos usually died four to 12 days after inoculation and large numbers of elementary bodies could be demonstrated in the yolk sac membranes.

By this method, virus was cultivated from the combined tissue from two fetal membranes from flock A and from one from flock B. Tissue suspensions from the lungs, liver, and kidneys of each of 2 fetuses in flock A were separately inoculated into eggs, resulting in the isolation of the virus from the lung of 1 fetus.

The characteristics of this virus and its behavior in inoculated laboratory animals have been studied and will be the subject of a further report.[11]

TABLE 1—Results of Complement-Fixation Test on Serums from Ewes in Naturally Infected Flock A

Animal	Date of sampling (1958)	Anticomplementary control (serum dilution 1:8)	Complement-fixation titer: Q fever antigen (specificity control)	Complement-fixation titer: Psittacosis antigen
1 Aborted	3/26	0	0	[32]
2 Aborted	3/26	0	0	[>*128]
3 Aborted	3/26	0	0	[32]
4 Aborted	3/26	0	0	0
5 Aborted	3/26	0	0	[64]
6 Aborted	3/26	0	0	0
7 Aborted	4/15	0	0	[64]
8 Aborted	4/15	0	0	0
9 Aborted	4/15	0	0	[>128]
10 Aborted	4/15	0	0	0
11 Aborted	4/15	0	0	0
12 Aborted	4/15	0	0	0
13 Aborted	4/15	0	0	0
14 Aborted	4/15	0	0	0

*> = greater than; [ ] = significant reaction.

SHEEP TRANSMISSION TRIAL

Fifteen pregnant, yearling ewes from an experimental flock maintained at this laboratory were employed in a virus-transmission trial. The breeding health of the flock had been under constant surveillance for several seasons and no unexplained abortions were recorded.

On April 21, 1958, 10 of the 15 ewes were inoculated subcutaneously with 1.0 ml. of a 1:2,000 dilution of a suspension of yolk sac membrane from an infected embryonating egg. The other 5 ewes were employed as controls and were inoculated with 1.0 ml. of a 1:2,000 dilution of yolk sac membrane from a noninfected embryonating egg.

All 15 ewes lambed normally within 15 days following inoculation. All newborn lambs were fully developed and viable. The fetal membranes from 4 inoculated ewes and from 3 control ewes were examined. None of these membranes showed gross abnormality, and smears from cotyledons, stained by the modified Ziehl-Neelsen method, did not reveal elementary bodies.

SEROLOGICAL EXAMINATION OF SERUMS

Serum samples from sheep in naturally infected flocks A and B, and in the experimental flock, were examined* in complement-fixation tests, using a psittacosis antigen of yolk sac origin. For each sample, anticomplementary activity was detected by the use of a control tube containing the lowest test dilution of serum (1:8) and all other elements of the test except antigen, which was replaced with saline solution. Nonspecific reactions due to the presence of yolk sac material were detected by

*Examined at the Rocky Mountain Laboratory, U.S. Public Health Service, Hamilton, Mont.

employing a Q fever yolk sac antigen as a specificity control. Negative control serums, and positive control serums of known titer for each of the antigens, were run simultaneously with the test serums.

In interpreting the tests, a psittacosis serum titer of 1:16 was considered significant, provided the serum was not anticomplementary and showed no nonspecific reaction to the other yolk sac antigen. No psittacosis titer was considered significant when the serum was found anticomplementary. Where nonspecific reactions to the other yolk sac antigen occurred in the absence of anticomplementary activity, the psittacosis serum titer could attain significance only when it was at least four times greater than the nonspecific titer.

Results of tests on 14 serum samples from 12 aborting ewes in the naturally infected flock A are shown (table 1). Ewes 1 to 6 were sampled within seven days of abortion and 4 had significant titers to the psittacosis antigen. Three weeks later, 2 of the 4 ewes were again tested, along with 6 other ewes from which serum was taken five to 50 days following abortion. Only two of these serums had significant titers to the psittacosis antigen and, unfortunately, since the identity of the samples could not be maintained, it is not known whether these two samples were from ewes previously tested.

Results of tests on serum samples from 12 ewes in the naturally infected flock B, including 4 ewes that aborted, are shown (table 2). Each ewe was tested on two occasions with an interval of three weeks. The 4 aborting ewes were first tested within two weeks after abortion. Significant titers against the psittacosis antigen were found in one or both serums from the 4 aborting ewes, and in one or both serums from 5 of the other 8 ewes.

Results of tests on serum samples from the 15 ewes of the experimental flock are shown (table 3). All of the ewes were tested before injection and three weeks thereafter. Three of the preinoculation samples (F1414, X6239, and D435) showed significant psittacosis titers for which no explanation can be offered. However, all but 2 (D425 and X6103) of the 10 ewes that were inoculated with infective material showed significant increases in their psittacosis titers three weeks later, while none of the noninfected ewes showed significant increase in titer.

DISCUSSION

In most instances where infectious abortions of sheep in the United States have been investigated bacteriologically, they have been associated with *V. fetus* infection, but serious losses have occurred in which routine laboratory examinations revealed no pathogenic bacterial agent. The findings reported here appear to justify the conclusion that an infectious type of abortion caused by a virus of the psittacosis-lymphogranuloma group also occurs in sheep in this country, and that the disease

TABLE 2—Results of Complement-Fixation Test on Serums from Ewes in Naturally Infected Flock B

Animal		Date of sampling (1958)	Anticomplementary control (serum dilution 1:8)	Complement-fixation titer: Q fever antigen (specificity control)	Complement-fixation titer: Psittacosis antigen
1	Aborted	5/ 1	0	16	{1024}
1	Aborted	5/21	+*	32	1024
2	Aborted	5/ 1	0	0	{>**1024}
2	Aborted	5/21	+	64	1024
3	Aborted	5/ 1	0	0	{1024}
3	Aborted	5/21	0	64	{>1024}
4	Aborted	5/ 1	+	24	>1024
4	Aborted	5/21	0	0	{>1024}
5	Lambed	5/ 1	0	0	{ 64}
5	Lambed	5/21	0	0	{ 768}
6	Lambed	5/ 1	0	0	{ 768}
6	Lambed	5/21	0	0	{>1024}
7	Lambed	5/ 1	0	0	{ 48}
7	Lambed	5/21	+	16	512
8	Pregnant	5/ 1	0	0	0
8	Lambed	5/21	0	0	0
9	Pregnant	5/ 1	+	48	16
9	Lambed	5/21	0	0	0
10	Pregnant	5/ 1	0	0	4
10	Lambed	5/21	0	0	0
11	Pregnant	5/ 1	0	0	{ 16}
11	Lambed	5/21	0	0	{ 64}
12	Pregnant	5/ 1	0	0	{ 32}
12	Lambed	5/21	+	16	192

*+ = anticomplementary serum; **> = greater than; { } = significant reaction.

is similar to the enzootic abortion of ewes described in Scotland.[8,13]

The clinical histories, particularly of flock A, were similar to those described in Scotland. The incidence of abortion in this flock, in 1957, was 13 per cent and, in 1958, was 4 per cent. In Scotland, the incidence seldom exceeds 5 per cent, except in the first year of infection, when the incidence may reach 25 to 30 per cent. In both instances, abortions occurred in the last month of gestation; the ewes often showed signs of illness for a few days before abortion; there was a vaginal discharge for a few days after abortion; and there was a low death loss among affected ewes.

In both instances, the appearance of the aborted fetuses and their membranes was variable. The fetuses were sometimes small and mummified and the fetal cotyledons showed degenerative changes.

The elementary bodies demonstrated in the fetal membranes from these flocks closely resembled those described[13] in size, morphology, location, and staining affinity. The serological studies recorded here indicate that, as in the Scottish studies, the virus belongs to the psittacosis-lymphogranuloma group, and this conclusion is supported elsewhere.[11]

The failure of our experimentally inoculated ewes to show clinical evidence of infection may be accounted for by the late stage of gestation of the sheep which were inoculated with infective material. Four of the 10 ewes lambed the day following inoculation, and the other 6 lambed five to 15 days after inoculation.

In past years, a considerable number of complement-fixation tests for psittacosis antibodies have been made, at the Rocky Mountain Laboratory, on random serum samples from sheep in two other states of this area. These workers have found such antibodies in 7 to 8 per cent of 734 serums tested.[4,5] These findings suggest the possibility that infection of sheep with a virus of the psittacosis-lymphogranuloma group may be widely distributed. Whether the antibodies found resulted from infection with a specific virus associated with abortion in ewes is unknown, but no other infections of sheep with viruses of this group are known to occur in this area.

It should be emphasized that the virus abortion of sheep described here is difficult to distinguish from vibrionic infection on clinical grounds alone, and that direct detection of its existence is possible only by

TABLE 3—Results of Complement-Fixation Test on Serums from Ewes in the Artificially Infected Flock

Group	Animal	Date of sampling (1958)	Anticomplementary control (serum dilution 1:8)	Complement-fixation titer: Q Fever antigen (specificity control)	Complement-fixation titer: Psittacosis antigen
"Infected"	V6140	4/21	0	8	24
	V6140	5/13	0	0	[128]
	V6163	4/21	0	0	12
	V6163	5/13	0	0	[96]
	F1361	4/21	0	16	48
	F1361	5/13	0	0	[1024]
	F1414	4/21	0	0	[24]
	F1414	5/13	0	8	[256]
	X6127	4/21	+	64	128
	X6127	5/13	0	12	[192]
	X6239	4/21	0	0	[16]
	X6239	5/13	0	8	[256]
	D366	4/21	+	32	64
	D366	5/13	0	16	[256]
	D425	4/21	+	32	32
	D425	5/13	0	0	[16]
	D504	4/21	+	16	48
	D504	5/13	0	0	[64]
	X6103	4/21	0	8	16
	X6103	5/13	+	16	96
Control	D389	4/21	0	0	trace
	D389	5/13	+	16	64
	D463	4/21	0	8	16
	D463	5/13	+	16	32
	D435	4/21	0	8	[48]
	D435	5/13	0	8	[48]
	D474	4/21	+	32	96
	D474	5/13	+	48	64
	D263	4/21	+	16	16
	D263	5/13	0	0	12

*+ = anticomplementary serum; [ ] = significant reaction.

the examination of fetal cotyledons for the presence of elementary bodies.

It is of interest that infection with this virus existed in flock D at the same time as a vibrionic infection. Virus infection in aborting flocks in which Salmonella infections also existed has been described.[7,12] These observations indicate the possibility that viral infections may be overlooked in flocks from which fetal membranes are not made available for examination, and in which more readily demonstrated bacterial agents may also be present.

SUMMARY

Abortions in sheep are reported in which no bacterial agent could be incriminated, and from which a virus of the psittacosis-lymphogranuloma group was isolated by inoculation of embryonating eggs. Elementary bodies were demonstrated in the fetal cotyledons, and complement-fixing antibodies of the psittacosis group occurred in the serums of affected sheep.

This disease is similar to the virus disease known in Scotland as enzootic abortion. Work is in progress to determine whether the viruses are identical.

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Viral Abortion in Sheep

Viral abortion in ewes has been reported for the first time in Hungary. The viral elementary bodies were demonstrated by Stamp's staining method of the fetal membranes of aborted fetuses. Mice were infected by the intranasal route, and the virus was passed from mouse to mouse using lung material. The virus could also be passed through chicken embryos.

In the flock, 9.1 per cent of pregnant ewes aborted and 17.6 per cent had stillborn lambs. No other pathogenic microorganisms were implicated by bacteriological and serological methods.—*G. Hajdú et al. in Mag. allatorv. Lap. (April, 1958): 83.*

Viral Abortion in Ewes in France.—Viral abortion in ewes seems to be more prevalent in France than has been recognized. To assure a correct diagnosis, all of the ewes in the flock should be tested. The disease can be easily identified by staining smears from aborted fetal cotyledon or from cervical secretion of the ewes. The virus withstands destruction for a relatively long time.—*P. Faye in Rec. méd. vét. (June, 1958): 351.*

[We still anticipate that a virus will be found responsible for abortions in many herds of swine in the U.S.A.—Ed.]

Virus-Abortus Infection in Ewes.—A virus belonging to the psittacosis-lymphogranuloma group was identified by the complement-fixation test in several large flocks of sheep, in Hungary, in which abortions or stillbirths had occurred. In these flocks, 6 to 46 per cent of the ewes were positive on serological tests, the highest titers being in the serum of aborting ewes. —*J. Romvary in Mag. allatorv. Lap. (April, 1958): 81.*

The Affect of *Ascaris Suum* Migration on the Severity of Swine Influenza

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SINCE SWINE influenza was first recognized as a clinical disease in 1918, it has been an important economic factor in swine production. This disease, which has a high morbidity and low mortality, usually occurs in autumn or early winter. The onset is sudden and accompanied by fever, anorexia, and prostration. In uncomplicated cases, recovery occurs within two to six days.

In 1931, eight strains of this virus were isolated during the 1928 to 1930 epizootics among midwestern swine.[5] These eight strains could be experimentally established and differed only in severity and mortality in the disease they caused. Later, it was reported that inoculation of bacteria-free filtered material containing any of the strains caused only a mild, afebrile disease of short duration.[6]

When, however, these virus strains were inoculated with the hemophilic bacillus *Hemophilus influenzae suis*, also isolated during the same epizootic, the characteristic disease was produced.[4]

Later, the influenza virus was found in a masked form in apparently healthy swine and it was shown that the virus could persist in the swine lungworm for extended periods of time.[7,8] The masked virus could be provoked by several methods, including intramuscular injections of *H. influenzae suis*, intrapleural injections of calcium chloride, ethyl alcohol given orally over long periods, and by the migration of large numbers of *Ascaris suum* larvae.[9,10]

In work previously reported from this laboratory,[11] it was shown that Ascaris migration would also enhance virus pneumonia of pigs (VPP). These studies, which were made with disease-free, colostrum-deprived pigs taken by hysterectomy, showed that lung consolidation in VPP was ten times as extensive following Ascaris migration as in pigs which received VPP virus alone.

The virus of VPP requires two to three weeks to develop typical lung lesions. Consequently, it was of interest to determine the influence of Ascaris migration on a viral respiratory agent which could develop a disease more rapidly. For this study, swine influenza was selected because it develops typical lung lesions in less than 24 hours, is enzootic in many areas, and is easily maintained in the laboratory.

The following is a report of one of the factors which can influence influenza, enhance the disease, and produce many of the clinical signs associated with field cases of typical swine influenza.

MATERIALS AND METHODS

Ascarid Larvae.—The methods used to obtain, incubate, and count the Ascaris eggs have been previously reported.[11] The inoculum for each pig contained approximately 100,000 Ascaris eggs suspended in 10 ml. of distilled water. The material was treated with 1,000 units of penicillin and 1,000 μg. of streptomycin per milliliter. The egg suspension was given with a stomach tube from a 10-ml. hypodermic syringe, followed by 10 ml. of distilled water to flush eggs adherent to the tube into the pigs.

Influenza Virus.—The virus used was Shope's S-15 strain of swine influenza. This strain was mouse- and egg-adapted and had been passed 232 times in mice and 22 times in embryonating eggs. The egg passage material was diluted 10^{-3} in nutrient broth and 5 ml. was given intranasally to the pig during light ether anesthesia. Approximately 100,000 $i.d._{50}$ doses of virus was inoculated into each pig. Except when otherwise stated, the virus was given on the fifth day following the ascarid feeding. Ascarid larvae began migration through the lungs on about the fifth day.[2]

In one experiment, lung lesions produced by egg-grown virus were compared to those produced by virus grown in pig lungs. Virus for the pig-to-pig experiment was prepared as follows: Lung tissue previously infected with virus grown in fertile eggs was minced with ground glass in a mortar and pestle. This material was diluted 1:10 in nutrient broth and centrifuged at 3,000 r.p.m. in a refrigerated centrifuge for 30 minutes. It was then treated with 1,000 units of penicillin and 1,000 μg. of streptomycin per milliliter for one hour, diluted 10^{-3}, and 5 ml. was given intranasally to each pig.

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TABLE 1—Comparison, in 47 Pigs, of Simple Swine Influenza Virus or Ascaris Infections with Simultaneous Infection with both Agents

Infections	No. of pigs	Condition of pigs					
		Dead	Poor*	Dead and poor (%)	Fair*	Good	Fair and good (%)
Ascaris + virus	16	7	2	56	5	2	44
Virus only	26	0	1	4	3	22	96
Ascaris only	5	0	0	0	0	5	100

*Refers to general condition and appearance of test pigs seven days after virus and 12 days after Ascaris inoculation.

Egg Inoculations.—Ten-day-old chicken embryos were inoculated via the allantoic route. The lung material was prepared as described for pig-to-pig inoculations. Virus was harvested after 48 hours and checked for quantity by hemagglutination of chicken red blood cells.

Test Animals.—The test pigs were taken by hysterectomy[12] and held in individual isolation units throughout the experiment. They were fed 12 oz. per day of a diet consisting of cow's milk, chicken eggs, and minerals. The pigs were kept at a room temperature of 90 to 95 F. They were approximately 5 days old when given the ascarid eggs and 10 days old when given the influenza virus.

The pigs were observed several times daily until killed for necropsy two to 28 days following the virus inoculations. They were graded on external appearances as good, fair, or poor, depending on the amount of flesh and the general appearance of the coat.

RESULTS

The results reported in this paper are from nine separate experiments involving 84 pigs obtained from 17 hysterectomies. The data presented (table 1) support the earlier report[6] that swine influenza in uncomplicated cases is a mild disease. Although the virus caused fairly extensive lung lesions, primarily in the apical and the cardiac lobes, the pigs did not manifest any of the classical clinical signs.

Pigs given virus only remained active, alert, in good flesh with a smooth coat, and showed no signs of illness. However, when the influenza virus was inoculated into the pigs in which the ascarid larvae were migrating in the lungs, more severe disease resulted. The majority of these pigs coughed, reduced their food intake, became prostrate, and died or recovered slowly.

On necropsy, the pigs given virus only showed varying degrees of lung lesions, some involving as much as one half of the total lung area. The bronchial lymph nodes were normal to slightly enlarged. The other organs appeared normal.

In the pigs given Ascaris eggs plus virus, the lung lesions ranged from total involvement in pigs that died to only small areas in the pigs with good external appearances. Generally, the area involved was in excess of one half of the total lung area. The bronchial lymph nodes were enlarged from two to six times. However, this enlargement was primarily due to the ascarids, as these enlarged nodes were also found in the pigs in the Ascaris-control group during the period of migration. The livers frequently had scars from the ascarid migration, while the other organs appeared normal.

The pigs given Ascaris eggs only coughed and "thumped" eight to ten days after inoculation, then recovered. On necropsy, they were in good condition and had no lung consolidation.

A separate series of experiments was undertaken to determine whether ascarid migration would reactivate older, established influenza lesions from which the animals were beginning to recover (table 2). Protocols were planned so that the migrating larvae would begin to arrive in the lungs seven, 14, and 21 days following

TABLE 2—Relationship of Time of Pulmonary Ascariasis to Extent and Persistence of Lung Lesions

Infections induced	Pulmonary ascariasis, in days, following virus inoculation								
	7-day ascariasis (Killed 10 to 15 days)*			14-day ascariasis (Killed 17 to 21 days)			21-day ascariasis (Killed 25 to 28 days)		
	No. pigs	Lung area consolidated	Host condition	No. pigs	Lung area consolidated	Host condition	No. pigs	Lung area consolidated	Host condition
Ascaris + virus	3	½-¾	Good	3	½	Good	2	Resorbed	Good
Virus only	13	¼-½	Good	6	Resorbed	Good	2	Resorbed	Good
Ascaris only	3	None	Good	5	None	Good	19	None	Good

*Number of days following virus inoculation.

the virus inoculation. The animals were killed for necropsy three to seven days following the arrival of ascarids in the lungs.

In the seven- and 14-day groups, animals given Ascaris plus virus showed an increase in the lung area involved, similar to the findings in the preceding experiments. The pigs, however, remained in good condition. The pigs given virus only had the expected areas of lung involvement in the seven-day group but, in the 14-day group, lesions were healing, or had healed, and the pigs were graded good by external appearances.

In the 21-day groups in both the Ascaris-virus and virus-control classifications, the animals had completely recovered and were in good condition. Lung material was cultured for virus by egg inoculation. Lungs contained virus during the first week but not at 14 and 21 days.

Pigs inoculated with the virus material prepared from pig lungs had lesions which were comparable to those found in animals inoculated with egg virus.

DISCUSSION

The results of this study indicate that influenza infection in 2- to 3-week-old pigs during ascarid migration can result in a more severe disease than that described[5] for the "classical concert" of influenza virus and *H. influenzae suis*. Field reports on influenza indicate that a mortality up to 4 per cent can be expected[5] in pigs of all ages.

In these experiments, 9 of 16 (56%) of the pigs given Ascaris plus virus died or were moribund on necropsy. This 56 per cent can be compared with the 4 per cent mortality for field cases or with the virus-control group which had no deaths and only 1 of 26 (4%) graded poor. However, at the other extreme, only 2 of 16 (12%) of the pigs in the Ascaris-virus group, as compared with 22 of 26 (85%) of the virus-control group, were graded good.

In the more advanced stages of influenza infections, which would have allowed the pigs to begin production of specific antibody to neutralize the virus, the ascarid migration only prolonged the duration of the lesions. This did not tend to reflect on the severity of the disease or the condition of the host.

As reported earlier,[11] the enhancement of the virus of influenza and of VPP by the migration of larval *A. suum* again emphasizes the importance of control measures for herds with histories of ascariasis problems. Effective means of control with the piperazine compounds[1] and hygromycin B[3] have been outlined. This control of Ascaris infections should be practiced in order to prevent comparatively benign agents from causing severe losses.

SUMMARY

Experimental evidence is presented that 2- to 3-week-old pigs develop a severe pneumonia when inoculated with swine influenza virus (Shope S-15) during the migration of *Ascaris suum* larvae through the lungs.

In pigs infected with Ascaris plus virus, 56 per cent died or were moribund, as compared with 4 per cent in virus-infected controls. Ascarid migration in animals with older established influenza infections did not cause high mortality, although lung lesions were more severe.

It is recommended that control measures for ascariasis be established to reduce losses due to interaction of ascarids and agents attacking the respiratory tract.

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A Serological Survey of Q Fever in Arizona

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Q FEVER is a recent addition to the list of diseases of animals transmissible to man. In man, it is a febrile illness, caused by the Rickettsia *Coxiella burnetii*, often diagnosed as atypical pneumonia or pneumonitis. The first case of Q fever was observed in Australia in 1935,[2] but there was little interest in the disease until 1946, when it appeared in Amarillo, Texas,[11] and Chicago, Ill.[9] In 1947, there was evidence that Q fever was endemic in southern California.

Since that time, extensive studies in California have shown that cattle, sheep, and goats are sources of the causative organism. Infected cattle show no clinical or pathological changes, and dairy cows show no drop in milk production.[3] The United States Department of Agriculture has not conducted any major investigational work on this disease because it is not an economic problem in the livestock industry.[7]

Man is the incidental host through contact with animals or some of their products. To effectively control Q fever in man, it would be necessary to control the spread of the organism by its host.

Since cattle raising is an important industry in Arizona, a serological survey of domestic animals was made for evidence of any areas in the state where Q fever was endemic.

MATERIALS AND METHODS

The complement-fixation technique employed[*] has been shown to be both sensitive and specific. Neither brucellosis nor syphilis antibodies will give a positive reaction with *C. burnetii* antigen.[3] On rare occasions, an anamnesis of Brucella antibodies may occur in Q fever but disappears early in the illness.[6] The purified rickettsial antigens will not produce positive complement-fixing reactions with convalescent serums other than those of Q fever.[12]

The complement-fixing antibodies of Q fever in man will persist for at least 17 months after infection.[10] A positive reaction to *C. burnetii* in the complement-fixation test is regarded as representing previous effective contact with the organism, and a high titer suggests current infection.[5]

The titer is expressed as the highest serum dilution giving 3+ or 4+ fixation. Titers of 1:5, or greater, have been considered of diagnostic value in Q fever.[3]

A screening test of three dilutions (1:5, 1:10, and 1:20) was performed on each serum to eliminate any "false negatives" due to the prozone effect. When a serum reacted in the 1:20 dilution, further dilutions were carried out to establish the endpoint.

The blood samples used were portions of those taken for the routine diagnosis of brucellosis[*] from livestock in widely separated geographical areas within the state (fig. 1). Dairy cattle comprised 29.2 per cent of the cattle studied.

A suspension of commercially prepared sheep red blood cells was used in the hemolytic system. The cells were washed by centrifugation three times or until the supernatant fluid was clear. A 3 per cent suspension of the sheep cells was made by resuspending the packed cells in the physiological saline solution containing 0.01 per cent magnesium sulfate and 0.004 per cent calcium chloride.

A commercial preparation of glycerinated anti-sheep hemolysin was used in these tests. The hemolysin was diluted to contain 2 M.H.D. (minimum hemolytic dose) units in 0.25 ml.

Sensitized red blood cells were then prepared by mixing equal quantities of hemolysin dilution and a 3 per cent suspension of washed sheep erythrocytes.

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The authors thank Keith Maddy, D.V.M., for his aid in obtaining the specimens for this study.

[*]The Agricultural Research Service of the U.S.D.A., Phoenix, cooperated in obtaining specimens for study.

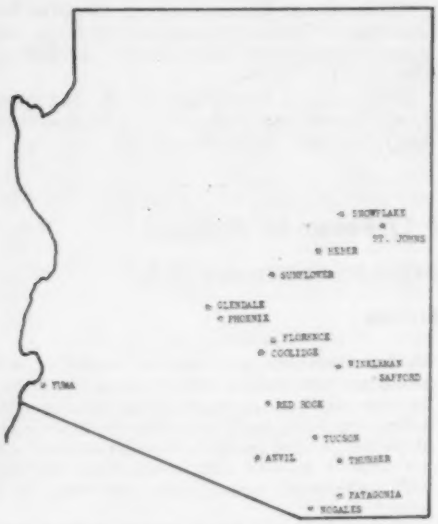

Fig. 1—Map of Arizona showing locations where blood samples of livestock were taken.

The complement used was a commercial preparation of dried pooled serum from healthy male or nonpregnant female guinea pigs. Fresh complement was titrated each day the tests were performed. Varying quantities, from 0.10 to 0.24 ml., of a 1:30 complement dilution were titrated in increments of 0.02 ml. The smallest amount of complement giving complete sparkling hemolysis was considered the exact unit, and the next higher amount as a full unit. Two full units of complement of 0.5 ml. were used in the performance of the test.

The antigen employed was a suspension of the Q fever rickettsias (American strain-Nine Mile).** The purified rickettsial antigen was prepared from infected yolk sacs. The immune guinea pig serum used as a control in these tests was supplied by a commercial laboratory.** The serums tested were inactivated at 56 C. for 30 minutes. Serial two-fold dilutions were made in the recommended physiological saline solution.

TABLE 1—Results of Complement-Fixation Tests to Coxiella Burnetii in Arizona, 1957

Species	No. tested	Positive reactors (No.)	Positive reactors (%)
Cattle	674	225	33.4
Sheep	62	3	4.8
Goats	15	1	6.6
Total	751	229	30.5

**Supplied for use in these studies by the Lederle Laboratories Division, American Cyanamid Co., New York, N.Y.

Quarter-milliliter amounts of antigen, at a dilution which represents 2 antigenic units, were mixed with 0.25-ml. volumes of the serum dilution, and then 0.5 ml. of complement containing 2 full units was added. After overnight incubation at 4 to 5 C., 0.5 ml. of sensitized sheep red blood cells was added. The mixtures were then incubated at 37 C. for 30 minutes. The test was read following the second period of incubation. A 3+ or 4+ fixation was regarded as positive for end-point determinations.

The necessary serum and complement controls were run with the serums being tested. A serum control to determine the anticomplementary effects was included. A complement titration was incubated overnight with the serums being tested to determine the amount of complement available after incubation. The complement control consisted of complement in 0.25-, 0.3-, and 0.5-ml. amounts. The test was not considered valid if less than 2 units of complement was present.

RESULTS

The complement-fixation tests on 751 serums from domestic livestock showed the incidence of antibodies to *C. burnetii* to be 30.5 per cent (table 1).

The geographic distribution and the degree of infection of the cattle tested is shown (table 2). Of the 674 cattle tested, 225 (33.4%) possessed specific antibodies. These herds fall into three general groups: those with few or no reactors; those with a high percentage of positive reactors, many with high titers (Yuma and Phoenix); and those with a high percentage of positive reactors, but with low titers. One exceptional area (Florence) had 23.4 per cent reactors, 2 of which had titers of 1:80.

DISCUSSION

No reports were found of any investigation of the incidence of Q fever in Arizona.

This survey indicates that in two areas in the state a large percentage of the animals tested were positive reactors with significantly high titers. High titer may be indicative of current infection.[1] In the Phoenix area, 36 (39.6%) of the 91 cattle tested, and at Yuma, 80 (75.5%) of the 106, gave positive serum reactions. Herds from these areas comprised the only dairy cattle investigated (of the 197 tested, 58.8% were positive).

Three other areas (Patagonia, Winkleman, and Sunflower) had a high percentage of positive reactors, but at low dilutions. This may be evidence of previous contact with the causative organism, *C. burnetii*.

TABLE 2—Geographic Distribution of Cattle with Complement-Fixing Antibodies to Coxiella Burnetii, 1957

Area	No. tested	Titer*										Positive reactors	
		5	10	20	40	80	160	320	640	1,280	2,560	(No.)	(%)
Yuma†	106	20	10	11	24	5	6	2	1	—	1	80	75.5
Patagonia	47	14	3	3	—	—	—	—	—	—	—	20	42.5
Nogales	33	2	—	—	—	—	—	—	—	—	—	2	6.0
Thurber	68	13	2	—	—	—	—	—	—	—	—	15	22.0
Anvil	60	2	1	—	—	—	—	—	—	—	—	3	5.0
Tucson	74	4	1	1	1	—	—	—	—	—	—	7	9.5
Red Rock	35	8	1	—	—	—	—	—	—	—	—	9	25.7
Winkleman	34	14	1	—	—	—	—	—	—	—	—	15	44.1
Florence	47	4	3	2	—	2	—	—	—	—	—	11	23.4
Coolidge	3	—	—	—	—	—	—	—	—	—	—	0	0
Phoenix†	91	13	9	3	3	4	2	2	—	—	—	36	39.6
Sunflower	29	13	9	3	—	—	—	—	—	—	—	25	86.2
Heber	4	—	—	—	—	—	—	—	—	—	—	0	0
Snowflake	11	—	—	—	—	—	—	—	—	—	—	0	0
St. Johns	32	2	—	—	—	—	—	—	—	—	—	2	6.2
Total	674	109	40	23	28	11	8	4	1	—	1	225	33.4

*Titer is expressed as the reciprocal of the highest serum dilution giving 3+ or 4+ fixation; †dairy cattle.

Although dairy cows are kept under more sanitary conditions, they are usually kept together in close quarters. This would facilitate the spread of the infectious organism and, in part, account for the high number of positive reactors. A small percentage of the beef cattle tested were positive reactors. These animals live under range conditions where dissemination of the rickettsias might be more difficult.

In Tucson where there is a low percentage of positive reactors, the results of the complement-fixation tests on cattle were corroborated by similar results with the serums of sheep which were kept in close quarters. Of the 15 goats tested, the 10 from Tucson were negative; 1 of 3 from Safford gave a positive reaction in the 1:10 dilution.

Although serums from only a relatively small number of animals were tested, there is evidence that a large percentage of these animals have had contact with the Rickettsia, *C. burnetii*.

Summary

A complement-fixation test was employed to determine the incidence of antibodies to *Coxiella burnetii*, the causative agent of Q fever, in the serums of domestic livestock in Arizona. Of the 751 cattle, sheep, and goats tested, 229 (30.5%) fixed complement in a dilution of 1:5 or greater.

In dairy cattle, there was a high percentage of positive reactors with relatively high titers while, in beef cattle from range areas, the percentage of positive reactors was low.

Although serum from only a few sheep and goats was tested, the reactions were similar to those found in cattle of the same area.

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Cryptococcic Arthritis in a Cocker Spaniel

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THE PURPOSE of this paper is to report the clinical course of a case of cryptococcosis in a dog, in which the chief signs were those of a septic arthritis. There were also a few signs of central nervous system involvement. Cryptococcosis in a dog, with initial lameness in the right foreleg and signs of brain involvement, was reported in 1952.[2]

The causative organism is a budding yeastlike fungus, *Cryptococcus neoformans* (*Cryptococcus hominis, Torula histolytica*). In man, the organism appears to have an affinity for the meninges. There is some evidence that the disease in animals "is a serious generalized infection analogous to the disease in man."[1]

CLINICAL HISTORY AND TREATMENT

A spayed Cocker Spaniel, 1½ years old, had been in good health. As a pup, she had a severe hookworm infestation, was given the usual vaccines, and was spayed at 6 months of age. On Oct. 18, 1956, she suddenly had an intermittent lameness in the left foreleg. When examined, no swelling or sensitiveness was found and she was sent home.

When returned six days later, she was still lame, there was a swelling at the left metacarpus, and her temperature was 103 F. A radiograph of the joint showed no changes. The condition was thought to be a tenosynovitis, and 600,000 units of penicillin and 10 mg. of prednisolone (Sterane*) were given intramuscularly (i.m.).

The dog seemed to improve but, 11 days later, it again was returned—this time it favored the right foreleg. The temperature was 102 F. The leukocyte count was 23,000 per cubic millimeter, and a differential count showed 82 neutrophils (69 segmented, 13 stabs), 12 lymphocytes, 2 monocytes, and 4 eosinophils per 100 w.b.c. The urine was normal. She was given chloramphenicol (Chloromycetin**), 250 mg. three times a day for five days, but failed to improve.

On November 14, the dog was still lame intermittently and the leukocyte count was 31,750 per cubic millimeter. The treatment was changed to oleandomycin tetracycline (Sigmamycin†), 250 mg. three times a day for five days, but with no clinical improvement.

When again examined two weeks later, she was thin, depressed, whined when handled, and had a temperature of 104 F. The owner reported that, for one day, the dog showed signs of being spastic. Two circumscribed ulcers, 3 mm. in diameter, had developed—one on the base of the tail, the other on the lateral surface of the right hind paw. The hocks and the right carpal joint were swollen, hot, and sensitive. The cervical, prescapular, and popliteal lymph nodes were enlarged.

The differential blood count showed 95 per cent neutrophils (69 segmented, 20 stabs, and 6 juveniles), 1 per cent lymphocytes, and 4 per cent eosinophils. The cytoplasm of some of the neutrophils showed toxic granules and vacuolization. The erythrocytes showed normocytic and normochromic regeneration. Platelets appeared normal in number and morphology. Fluid removed from the right carpal joint was cultured.

The owner asked that the penicillin treatment be repeated, since the dog had seemed to improve for ten days after the initial injection. Therefore, large doses of penicillin (1,000,000 units of crystalline, i.v., and 600,000 units of aqueous, i.m.) were given daily for three days. The temperature returned to normal but no clinical improvement was evident.

Initial culture was set up in Brewer's thioglycollate broth for purposes of enrichment. Simultaneously, Petri dishes of chocolate agar and blood agar were streaked for isolation. The chocolate agar plate was incubated in a jar of CO_2 and the

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The author thanks Dr. Henry G. Kupfer, professor of clinical pathology and director of laboratories, and Dr. Miles E. Hench, associate professor of bacteriology, Medical College of Virginia, Richmond, for their diagnostic aid; also, Dr. J. T. McGrath, associate professor of veterinary pathology, University of Pennsylvania, School of Veterinary Medicine, Philadelphia, and Dr. Wm. H. Rhodes for the necropsy and radiological findings.

*Sterane is produced by Chas. Pfizer and Co., Inc., Brooklyn, N. Y.

**Chloromycetin is produced by Parke, Davis and Co., Detroit, Mich.

†Sigmamycin is produced by Chas. Pfizer and Co., Inc., Brooklyn, N. Y.

blood agar plate was incubated aerobically. Typical, spherical, single-budding yeast cells grew in the enrichment broth medium, and small glistening, dome-shaped, brownish to clear colonies appeared on the blood agar plate.

Subcultures were made on December 3, from the Brewer's medium to Petri dishes of mycosel§ agar containing penicillin, streptomycin, and actidione, and to Sabouraud's agar which contained no chemotherapeutic agents. India ink preparation from both the Brewer's medium and the blood agar revealed the capsular organisms. At this time, a presumptive identification of *C. neoformans* was made from the cultures.

The mycosel subculture failed to grow and the Sabouraud's agar showed typical growth in two days. Two days later, 3 mice were inoculated intraperitoneally with organisms in physiological saline suspension. The mice showed signs of illness in four or five days and 1 died the sixth day. Cryptococcic organisms were found in smears of the brain. The other 2 survived for 18 and 19 days. One mouse was lost due to putrefaction, but cryptococcic organisms were found in the spleen, liver, lungs, and brain of the other mouse.

The owner was advised of the diagnosis of *C. neoformans* infection and of the hopeless prognosis and was cautioned of the communicable possibilities of the disease to man and other animals. However, she asked that nystatin (Mycostatin‡) be tried (*in vitro* tests showed that it kills or inhibits many species of yeast and fungi), so 500,000 units of nystatin and 250 mg. of tetracycline-nystatin (Mysteclin‡) were used three times a day for five days. There was no clinical improvement so, on January 15, the dog was sent to the University of Pennsylvania, School of Veterinary Medicine, for further study and necropsy.

RADIOLOGICAL EXAMINATION OF THORAX AND EXTREMITIES

A lateral radiograph of the thorax showed no abnormalities, but a radiograph of the hindlimbs showed increased irregular trabecular markings and early osteolytic changes along the tibial crests and the femoral condyles. The bones of the left tarsus and the distal epiphysis of the tibia showed osteolytic changes, as indicated by the "moth-eaten" appearance. The soft tissue surrounding the tarsus was swollen. The left carpus (fig. 1, 2) showed soft tissue swelling and metacarpal bones 4 and 5 appeared osteolytic in the presence of new periosteal bone formation. The radiographs give the impression of an articular and periarticular inflammatory process involving bone as well as soft tissue.

Cerebrospinal fluid obtained by cisterna magna puncture was clear and no cells were found; the total protein was 20.0 mg.

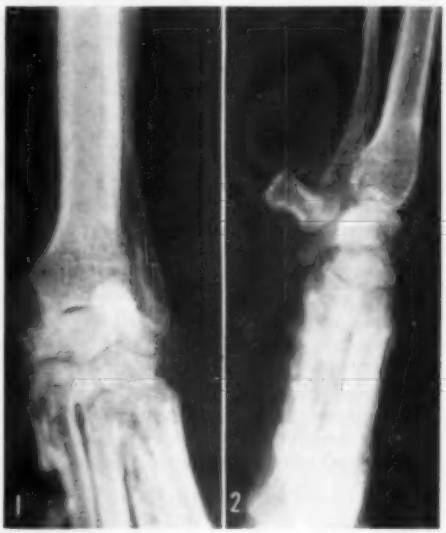

Fig. 1, 2—Anteroposterior (left) and lateral (right) views of the left carpus of a dog, showing soft tissue swelling and "moth-eaten" osteolytic changes of two months' duration, due to Crytococcus neoformans infection.

per 100 cc.; there was no reduction of glucose and the globulin ratio was not increased. Smears stained with India ink revealed typical yeastlike organisms.

NECROPSY FINDINGS

The lungs were of the usual size, shape, and general consistency, but a few scattered, light tan, firm foci, measuring up to 2.0 mm. in diameter, were found. A slight amount of frothy, clear fluid exuded from the cut surface.

The spleen was of the usual size and consistency, but contained two rather firm tan nodules 2.0 mm. in diameter.

Most of the lymph nodes were enlarged, firm, and brownish gray. The popliteal nodes measured 4.0 by 3.0 by 3.0 cm. and were softer than the others.

The leptomeninges of the brain were markedly reddened, especially over the occipital cortex. The cerebellum contained a small cyst 1.0 mm. in diameter. Smears of

‡Baltimore Biological Laboratory.
‡Mycostatin and Mysteclin are produced by E. R. Squibb and Sons, Brooklyn, N. Y.

cerebrospinal fluid, stained with India ink, revealed typical yeastlike organisms.

Histological examination was made of the bones, affected joints, lungs, kidneys, liver, stomach, small intestines, brain, spinal cord, spleen, and anterior cervical, bronchial, axillary, iliac, and popliteal lymph nodes. The joint and bone lesions showed marked periarticular inflammation and osteolytic changes. Multiple subpleural granulomas were present. In the liver sections there were multiple perilobular changes, with minimal cellular reaction.

Granulomatous reactions were present in the spleen and lymph nodes; also in the medulla oblongata, cerebellum, midbrain, basal ganglia, parietal cerebral cortex, and frontal lobes. Extensive cystlike formation was found in the olfactory region, basal ganglia, parietal cortex, cerebellum, and medulla oblongata. The spinal cord showed focal cellular infiltration generally related to roots of the spinal nerves in the subarachnoid spaces.

Cryptococcus organisms were identified, even in hematoxylin and eosin stained sections, in all affected structures.

SUMMARY

A clinical course of a septic arthritis in a Cocker Spaniel, of two months' duration, is described. Lesions consisted of a periarticular and erosive arthritis, focal dermatitis, generalized lymphadenitis and splenitis, meningoencephalitis, and disseminated lesions of the lung and liver. Numerous antibiotics failed to alter the course of the disease, although penicillin in massive doses appeared to lower the temperature.

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Sensitivity of Cryptococcus Neoformans to Antibiotics.—When *C. neoformans* was treated *in vitro*, actidione showed antifungal action at concentrations of 5 to 10 gamma/cc.; nystatin at 40 to 160 gamma/cc.; neomycin and polymyxin B at 320 to 640 gamma/cc. Isoniazid was completely inactive. However, all of these agents were substantially inactive when used against this infection in the udders of cows and goats. Actidione and nystatin would sterilize the milk but did not effect changes in the mammary glands.—*G. Redaelli and F. Rosaschino in Arch. Vet. Ital. (Aug. 31, 1957): 311.*

Infectious Canine Hepatitis in a Native Dog

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Since infectious canine hepatitis was described in Sweden, in 1947,[2] and in the United States, in 1948,[1] there have been reports of its occurrence in other parts of the world. In the Philippines, it has been clinically observed, especially among the foreign breeds, but has not been diagnosed histopathologically. The case in this report is the first to be encountered in native dogs at the college hospital, and it was diagnosed when histopathological examinations of different tissues were made.

CASE REPORT

A white, male, native dog, 3 years old, was brought to the college hospital for treatment on the morning of April 11, 1956. The dog was greatly depressed and died that afternoon. A pool of dark, uncoagulated blood had escaped from the anus, and a sticky, yellowish discharge had come from the mouth. A necropsy was performed immediately.

Gross Pathological Findings.—The peritoneal cavity contained about 250 cc. of serosanguineous fluid. The buccal mucosa was pale and the mouth contained flecks of blood. The esophagus showed petechiae in some areas and a tumor-like nodular growth, containing an adult *Spirocerca lupi*, in the distal third.

The stomach contained about 30 cc. of bloody fluid and the mucosa was hemorrhagic. The small intestine was petechiated and contained a blood-tinged sticky fluid. The colic and cecal mucosae were hemorrhagic and both organs contained dark, tarry, uncoagulated blood. The liver was swollen and friable and was mottled with necrotic areas. The lungs were slightly edematous, with hemorrhagic areas of varying sizes. Portions of the liver, kidney, lungs,

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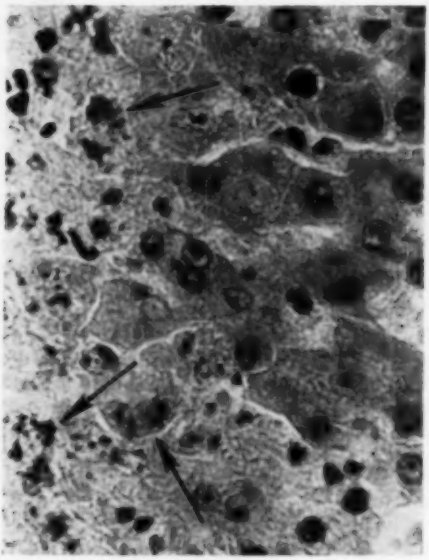

Fig. 1—Degenerative changes and brown-staining pigments (arrows) in the liver of a dog with infectious canine hepatitis. x 430.

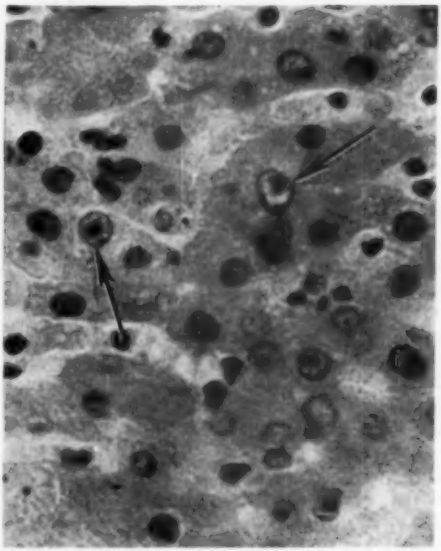

Fig. 2—Typical intranuclear inclusion bodies (arrows) in the liver of a dog, diagnostic of infectious canine hepatitis. x 430.

and spleen were preserved in formalin. Paraffin sections were made and stained with hematoxylin and eosin.

Microscopic Pathological Findings.—Microscopic examination of sections from the liver showed lesions typical of infectious canine hepatitis. There were areas of necrosis scattered throughout the tissue. Degenerative changes of the hepatic cells were observed, with some nuclei showing hypertrophy. Brown-staining pigments, believed to be hemosiderin, were distributed in the tissue (fig. 1), but were most marked in the necrotic areas. Intranuclear inclusion bodies, diagnostic of this disease, were observed (fig. 2).

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Effects of Infusion Time on Maintenance Fluid Therapy.—A study was made on the effects of variations in administration of multiple electrolyte solutions on body water and electrolyte composition and on patient comfort.

Patients on continuous 24-hour administration lost the least amounts of water and electrolytes and had the lowest prevalence of hunger, thirst, and other physical discomforts. Those on a 12-hour regimen lost approximately twice as much water, sodium, potassium, and chloride from their body stores. Those on a six-hour program lost larger amounts of water and solute than the 12-hour subjects, and complained slightly more of hunger, thirst, and discomfort during the intervals when they were fasting and thirsting.

It apparently is physiologically safest to give patients requiring parenteral fluid maintenance therapy their daily allotment in a continuous manner.—*New England J. Med. (June 19, 1958): 1239.*

Killing Trichina by Freezing

Refrigeration experiments showed that Trichina in pork were killed at −15 to 17 C. (5.0 to 1.4 F.) in four to six days, or by rapid freezing to −30 C. (−22 F.) for 14 hours. (An exception was a cat which was infected from pork held at −15 C. for 6 days).—*W. Varges in Monatsh. f. Vet-med. (June 15, 1958): 365-369.*

Nutrition

Moldy Corn Poisoning of Equidae

A spontaneous, hitherto unknown, disease of equine animals, resembling an acute encephalitis, is reported from China. It was afebrile and fatal within six hours to five days. It could be differentiated from infectious encephalomyelitis by the lack of jaundice and of an increased bilirubin or in the cellular elements of the blood. Instead of perivascular cell infiltration, there was chiefly edema and necrosis in the brain, almost exclusively in the white substance. Similar changes were found in all portions of the spinal cord, mainly in the gray substance. There was also inflammation, hemorrhage, erosions, and tumors in the mucous membrane of the intestinal tract, and hemorrhages in the mucosa of the bladder.

The disease was reproduced in 9 of 14 donkeys and horses by feeding 1.5 to 3.5 lb. of moldy corn daily for 11 to 53 days. This was considered a mycotoxicosis similar to that described in the United States as moldy corn poisoning (JOURNAL, Nov., 1952: 402). The authors suggest that it be called mycotoxic encephalomalacia.—*X. Iwanoff et al. in Arch. f. exptl. Vet.-med., 11, (1957): 1035-1056.*

[This disease has also been reported from Greece, *see* JOURNAL, Nov., 1954, page 407.]

Ground Corn Cobs as Roughage for Dairy Cows.—Two studies involving 31 cows were conducted to evaluate the use of ground corn cobs for use as a source of roughage and to determine the extent to which they could be used as a substitute for hay. A high protein grain mixture was used to supply the minimum digestive requirements.

In one trial, there was no effect on milk production, fat test, or body weight when cobs were substituted for hay at the rate of 8 lb. and 16 lb. per day. Results of the second trial showed that cobs could replace up to 80 per cent of the total roughage intake without seriously affecting milk production.—*AFMA Nutr. Abstr., May, 1958.*

Use of Salts to Control Intake of Protein Supplements for Cows.—Cottonseed meal containing 25 to 30 per cent of salt was self-fed to beef cows for over 100 days in each of three winter periods without visible, harmful effects on the cows or their nursed calves. Cows fed an equal amount of unsalted cottonseed meal (2 lb. daily) lost less weight during the winter feeding period but their total gains were about the same for the entire year.—*Feed Bag (July, 1958): 39.*

Grass Tetany

Hypomagnesemic tetany, a clinical condition peculiar to ruminants, occurs when cattle are first placed on lush pasture in the spring and early summer. However, the "tetany-producing pastures" retain this property for only a few weeks.

This condition is apparently not a simple dietary deficiency. Although the serum magnesium concentration falls rapidly, a chemical analysis may show that the herbage contains adequate magnesium. Nevertheless, tetany can be prevented during the danger period by daily doses of magnesium oxide or by increasing the magnesium content of the pasture.

The tetany can be induced by using heavy dressings of nitrogenous fertilizers to produce a lush growth before grazing starts, which indicates that the condition could be related to the protein content of the diet. It also could be due to chemical changes in the rumen which interfere with the absorption of magnesium.—*A. A. Wilson in Vet. Rec. (May 10, 1958): 406.*

Vitamin A and Fertility in Cockerels

The general condition, libido, and the volume of the ejaculum in cockerels were not affected by a deficiency in vitamin A and carotene. However, the semen became watery and transparent, the spermatozoa less concentrated and progressively less motile, and the number of abnormal forms increased.

The conditions were restored to normal when 30,000 I.U. of vitamin A per kilogram of feed was given for two weeks.—*Vet. Bull. (July, 1958): Item 2253.*

Cobalt Deficiency in Sheep.—A large cobalt bolus, which will remain in the paunch for many months, will prevent the wasting diseases in sheep caused by cobalt deficiency in the soil.—*Sci. News Letter (July 26, 1958): 61.*

Vitamin D_2 Prevents Parturient Paresis.—When a single intravenous injection of 10 million I.U. of vitamin D_2 in soluble

form was given two to eight days before parturition, in Holland, only 6 of the 39 cows developed the disease, compared with all of 18 untreated cows. All of the cows had been affected at previous calvings.—*Vet. Bull. (July, 1958): Item 2257.*

Peanut Oil for Bloat Control

Forty-five Hereford cattle, 9 months old, were allotted to three groups which were grazed in weekly rotation on pasture lots which were chiefly white and red clover. Peanut oil was added to the drinking water of group 1 (12 oz. of oil per head daily); was given in the water and sprayed on the forage of group 2 (14 oz. of oil per head daily); while group 3 was given no oil.

There was a reduction in the incidence and degree of bloat in both treated groups but 2 deaths, considered due to frothy bloat, occurred in each treated group while no deaths occurred in the controls. None of the animals which died were severely bloated. Weight gains were most rapid while the animals were on treatment, presumably due to their greater intake of feed.—*W. H. Southcott and R. W. Hewetson in Austral. Vet. J. (May, 1958): 136.*

A Remedy for Frothy Bloat

In an experiment on treatment of acute tympanitis in cattle caused by frothy fermentation, 20 to 30 ml. of equal parts ethyl- and normal buthyl-alcohol, injected into the rumen, was effective in hindering bloat and in breaking the frothy mass.—*Tolgyesi Gyorgy in Magyar allatorv. Lap. (June, 1958): 148.*

Enterotoxemia of Pigs

A designation of "piglet enterotoxic colibacillary syndrome" has been suggested as the most suitable for the disease variously called "edema disease," "hemorrhagic gastroenteritis," "weaning disease," "colibacillary toxemia," and "enterotoxemia."

The authors have corroborated previous findings that three serotypes of *Escherichia coli*, characterized by their hemolytic properties, are the causative agents. These organisms elaborate a thermolabile enterotropic toxin and, when injected into a pig, they induce specific antibodies.

Factors which aid the bacterial infection include weaning and an inadequate diet, particularly a lack of proteins or an excess of carbohydrates. Thus *Esch. coli*, an ordinary inhabitant of the intestinal tract, seems to become pathogenic under certain conditions. Treatment with cortisone, phthalyl-sulfathiazole, and antibiotics seems to be of value. Hygienic and dietary measures are important since no vaccination can be preconceived.—*C. Quinchon et al. in Rec. méd. vét. (July, 1958): 437.*

Influence of Antibiotics on Palatability of Swine Rations.—Three feeding trials involving 62 pigs were conducted to determine the effect of chlortetracycline, oxytetracycline, penicillin V, and erythromycin on the palatability of swine rations. The pigs preferred the rations containing chlortetracycline, showed a distinct dislike for the feed containing erythromycin, and showed neither preference nor dislike for the other antibiotics tested.—*AFMA Nutr. Abstr. May, 1958.*

An Edema Entity in Chickens

Many interested groups are concentrating on an edema entity in chickens (JOURNAL, March 1, 1958: 216; and Aug. 1, 1958: 172) and the results may be briefly summarized as follows: This disease is not related to fats *per se* at any level of feeding. On fractionation, the toxic principle is concentrated in the unsaponifiable portion of the fat.

The typical disease has been experimentally produced regularly only in young growing chicks. The principle appears to be nontoxic for pigs, calves, mice, and rats.

When signs of the disease appear, no treatment has been of value. The only effective preventive measure is to change to a ration containing a wholesome fat. Diagnosis is not clear-cut in borderline cases; similar signs develop in certain other diseases.—*AFMA Bull, June 11, 1958.*

Gibberellin-Treated Fruits.—When the first crop of grapes which had been stimulated with gibberellins on a commercial basis were marketed, the price was 50 per cent above that of similar nontreated grapes. Naval oranges treated with gibberellins had a 9 per cent greater juice content and a 13 per cent greater vitamin C content than controls.—*J. Agric. and Food Chem. (July, 1958): 493.*

Editorial

Dr. Kingman Appointed Executive Secretary

Announcement of the appointment of Dr. Harry E. Kingman, Jr., as executive secretary of the AVMA, effective Sept. 1, 1958, was made by the Executive Board during the Philadelphia convention. This comes just five years after he joined the headquarters staff as assistant executive secretary in September, 1953.

Dr. Harry E. Kingman, Jr.

He succeeds Dr. John G. Hardenbergh, whose request that plans be made for his retirement after nearly 18 years as executive secretary was granted by the Executive Board. Dr. Hardenbergh will remain as general consultant and also serve as the Association treasurer until Dec. 31, 1959.

Dr. Kingman was born in Fort Collins, Colo., Sept. 4, 1911, and, following in the footsteps of his father, Dr. H. E. Kingman, Sr., attained his D.V.M. degree in 1933 at Colorado A. & M. College, now Colorado State University. Following graduation, he engaged in general practice in California for about a year and then joined the Bureau of Animal Industry staff there and was engaged in tuberculosis eradication work until 1936, when he took part in the calfhood vaccination program against brucellosis. In 1939, he came to Chicago and worked in the Meat Inspection Division and BAI Pathological Laboratory until joining the staff of Wilson and Co. the next year.

Dr. Kingman was, first, a member of the veterinary division at Wilson and Co. and, from 1950 to 1953, assistant director of research of the company.

His work brought him in close contact with many aspects of the livestock and meat industries and with allied organizations, also with federal government departments, especially the Department of Agriculture.

He has been a member of the AVMA since graduation, was elected treasurer in 1951, and was active in other Association work before being appointed assistant executive secretary on Sept. 1, 1953, to succeed Dr. C. D. Van Houweling. In addition to the duties of that office, he has served as director of professional relations and *ex officio* chairman of the Committee on Program (section officers) for the annual AVMA convention.

Dr. Kingman's wide range of professional experience, broad acquaintance with leaders in various fields and intimate knowledge of Association activities make him exceptionally well fitted for his new position.

Farmers Demand Rabies Eradication

An editorial in the *Livestock Breeder Journal*, March, 1958, mentions the great saving to the livestock interests of the nation by the successful eradication of aftosa in Mexico and Canada, as well as our progress toward eradication of tuberculosis and brucellosis in cattle. It also reminds its readers that rabies has been eradicated from the British Isles. It states that 72,314 animals and 129 persons in the United States have died of rabies in the last ten years, with livestock losses greatest in the eastern and southern states.

The editorial points out that the first step in the control of rabies in wildlife is to reduce the number of these animals by trapping and poisoning. Although dogs in the area must be vaccinated, one Virginia county paid bounties of $2.50 each on 336 gray foxes because rabies was common in that species.

The article concludes that local control, backed by state law, with the aid and advice of federal experts is necessary for successful eradication.

ABSTRACTS

Oxygen Uptake in Liver Homogenates

When liver samples from normal cows were incubated in buffered potassium mediums without added substrates, QO_2 values of 2.0 to 4.0 were obtained. The effects of some volatile fatty acids, ketone bodies, glucose, and some citric acid cycle intermediates on the respiratory rate of liver homogenates were observed.

The QO_2 values of liver samples taken from 2 ketotic cows were studied, and a definite decrease in the respiratory rate was observed. The possibility that this depressed respiratory rate may be a reflection of the *in vivo* metabolism of the ketotic cow was considered.—[*F. Sauer, W. M. Dickson, and H. H. Hoyt: Oxygen Uptake in Liver Homogenates Taken from Normal and Ketotic Cows. Am. J. Vet. Res., 19, (July, 1958): 567-574.*]

Neurotropic Equine Influenza Virus

Horses were injected with a living neurotropic variant of the equine influenza (mare abortion) virus and observed for clinical, hematological, and immunological reactions. Of the 12 mares injected by intrauterine route, at least 1 aborted as a result of the infection. The clinical response of horses injected subcutaneously was lacking or minimal. Field tests of the neurotropic strain suggested that attenuation of the virus had occurred.

All horses in the study produced complement-fixing and neutralizing antibody to the same degree that would be expected in horses injected with field strains. The results of the study suggest a possible means of vaccinating horses against equine influenza and virus abortion.—[*Robert J. Byrne, Alice Lee Quan, and Victor R. Kaschula: Responses of Horses to a Neurotropic Strain of Equine Influenza Virus. Am. J. Vet. Res., 19, (July, 1958): 655-660.*]

Test for Avian Salmonellosis

An indirect hemagglutination test, using 0.5 per cent chicken erythrocytes sensitized with supernatant fluids from heated Salmonella cells, was compared with the agglutination test in both experimentally and naturally infected chickens and turkeys. Indirect hemagglutinin titers appeared earlier, persisted longer, and were approximately ten times greater than agglutinin titers. A slight increase in nonspecific indirect hemagglutinin titers occurred during infections.

Salmonella typhimurium-infected chickens treated with furazolidone developed detectable indirect hemagglutinin titers but not agglutinin titers. Polyvalent indirect hemagglutination tests were equally as sensitive as monovalent indirect hemagglutination tests. The spread in titers between an uninfected flock and a *S. typhimurium*-infected flock was adequate for diagnostic purposes.

Monovalent 2.5 per cent sensitized erythrocytes used as a plate test gave results similar to the tube test. Lack of correlation between carrier and reactor states indicated that serological tests should be limited to flock detection.—[*John McNeill Sieburth: The Indirect Hemagglutination Test in the Avian Salmonella Problem. Am. J. Vet. Res., 19, (July, 1958): 729-735.*]

Nematodirus Spathiger in Lambs

In a series of six experiments, 23 lambs were exposed orally to 80,000 to 396,000 infective *Nematodirus spathiger* larvae. All 5 lambs exposed at 1.5 months of age died, none of 3 exposed at 2.5 months died, and 1 of 7 exposed at 3.0 months died. Lambs older than 3 months showed only a transient diarrhea after exposure. Diarrhea generally coincided with the appearance of ova in the feces, but did precede it by as many as three days. Failure to gain weight normally varied from slight in lambs with mild infections to marked in those which died of the parasitism.—[*Lee Seghetti and Clyde M. Senger: Experimental Infections in Lambs with Nematodirus Spathiger. Am. J. Vet. Res., 19, (July, 1958): 642-644.*]

Intravenous Injection of Embryonating Eggs

A technique for the intravenous injection of embryonating eggs via the chorioallantoic vessels, using a simple egg-holding device, was described. The new technique is simple and permits the rapid injection of eggs, which is particularly advantageous in studies of dynamic systems such as blood clearance rates.—[*Charles M. Barnes and Logan M. Julian: A Technique for the Intravenous Injection of Embryonating Eggs. Am. J. Vet. Res., 19, (July, 1958): 759-760.*

BOOKS AND REPORTS

Aids to Organic Chemistry

This book serves as an introduction to the chemistry of compounds of biological and medical interest. It contains sections on the general structure and chemistry of compounds containing carbon, hydrogen, and oxygen, of the main classes of organic nitrogen compounds, and of compounds of sulfur and phosphorus. This newest edition, the fifth, has been completely rewritten and revised. —[*Aids to Organic Chemistry. By Dr. George A. Maw. 176 pages. Bailliere, Tindall and Cox, 7 and 8 Henrietta St., W.C. 2, London, England (Williams and Wilkins Co., Baltimore, Md., exclusive U.S. agents). 1958. Price $2.50.*]

Your Budgie's Health Book

For the parakeet owner, this book is a source of practical information on budgerigar diseases, breeding problems, and general care. Several helpful illustrations and pictures are included.—[*Your Budgie's Health Book. By Cessa Feyerabend. 120 pages. All-Pets, Inc., Fond du Lac, Wis., 1957. Price not given.*]

THE NEWS

Veterinarians Awarded Advanced Degrees

During the 1957-1958 academic year, the following advanced degrees were granted to veterinarians engaged in postdoctoral studies:

AWARDED MASTER OF SCIENCE (M.S.) DEGREE

Name of student	Title of thesis	Major professor	Dept. and school	Date granted
Eugene William Adams, D.V.M.	Histological and Histochemical Observations on Bovine Teat Epithelium	C. J. Rickard	Dept. of Pathol. & Bacteriology N. Y. State Vet. College, Cornell Univ.	September, 1957
A. F. Alexander, B.A. D.V.M.	Gross Cardiac Changes in Bovine High Mountain Disease	Rue Jensen	Pathology Dept. College of Vet. Med., Colo. State Univ.	August, 1958
Martin C. Anderes, D.V.M.	Pineal Organ of the Turkey	Walter Venzke	Dept. of Vet. Anatomy College of Vet. Med., Ohio State Univ.	August, 1957
Madan B. L. Bharadwaj, Grad. of Vet. Sci., Bihar Vet. College	The Histology of the Urethral Epithelium of the Domestic Animals	M. Lois Calhoun	Anatomy Dept. College of Vet. Med., Mich. State Univ.	June, 1958
Bruce Orr Brodie, D.V.M.	Treatment of *Tritrichomonas Foetus* Infection in Bulls	Loyd E. Boley	Dept. of Vet. Med. Sci. College of Vet. Med., Univ. of Illinois	June, 1958
Delmar R. Cassidy, D.V.M.	Immunological and Cultural Characteristics of the Causative Agent of Avian Infectious Synovitis	L. C. Grumbles	School of Vet. Med., A. & M. College of Texas	May, 1958
Augusto Castillo, D.V.M.	A Test for Fat Absorption in Dogs	John Bentinck-Smith	Dept. of Pathol. & Bacteriology N Y. State Vet. College, Cornell Univ.	February, 1958
Philip Coleman, D.V.M.	Acquired Immunologic Unresponsiveness to Newcastle Disease Virus	R. P. Hanson	Dept. of Vet. Sci. College of Agriculture, Univ. of Wisconsin	June, 1958
James B. Corcoran, D.V.M.	Chemical Factors Influencing Inflammatory Reaction: Water Soluble, Essential Amino Acids	Walter Joel, M.D.	Dept. of Pathol. School of Med., Oklahoma State Univ.	June, 1958
Charles E. Cornelius, B.S. D.V.M.	Serum Protein Turnover Rates in Dairy Cows Using Carbon-14 Labeled Glycine	Max Klieber	School of Vet. Med., Univ. of Calif.	January, 1958
Peter H. Craig, B.S. V.M.D.	Chemical Preprotection Against Nitrogen Mustard in the Canine	E. L. Stubbs	Graduate School of Arts & Sciences, University of Pa.	February, 1958
John P. Davis, Jr., D.V.M.	Justification of the Open Reduction and Gemellus Muscle Transplantation Method for the Reduction and Fixation of Coxofemoral Luxations of the Dog	I. B. Boughton	School of Vet. Med., A. & M. College of Texas	May, 1958
Elmo De La Vega, D.V.M.	Some Local and General Effects of Highly-Chlorinated Naphthalene Poisoning	Peter Olafson	Dept. of Pathol. & Bacteriology N.Y. State Vet. College, Cornell Univ.	June, 1958
Vincente De Paulo Costa Val, D.V.M.	The Action of Acetylcholine, Arecoline, and Lentin on the Electrocardiagram of the Dog	H. H. Dukes	Dept. of Physiol. N.Y. State Vet. College, Cornell Univ.	September, 1957
Bernard C. Easterday, D.V.M.	Methods for the Study and Detection of Bacterial and Viral Bovine	R. P. Hanson	Dept. of Vet. Sci. College of Agriculture, Univ. of Wisconsin	February, 1958

AWARDED MASTER OF SCIENCE (M.S.) DEGREE—*Continued*

Name of student	Title of thesis	Major professor	Dept. and school	Date granted
B. B. Hancock, D.V.M.	The Cultivation of Swine Kidney Cells and Their Use in Virus Studies	Jorge Birkeland	Dept. of Bacteriology College of Vet. Med., Ohio State Univ.	August, 1957
Klaus Hubben, V.M.D. M.S.	Pathogenesis of Infectious Synovites of Chickens	E. L. Stubbs	Graduate School of Arts & Sciences, University of Pa.	February, 1958
William G. Huber, B.S D.V.M.	Toxicity of Hexachloronaphthalene for Young Swine	R. P. Link	Dept. of Vet. Pathol. & Hyg. College of Vet. Med., Univ. of Illinois	August, 1957
Sohan Lal Issar, G.V.Sc.	The Carrier State in Leptospirosis Infected Animals Following Vaccination with *Leptospira Pomona* Bacterin	M. J. Twiehaus	School of Vet. Med., Kansas State College	June, 1958
Gordon Janney, D.V.M.	An Evaluation of Diagnostic Methods for Bovine Brucellosis in Field Herds	D. T. Berman	Dept. of Vet. Sci. College of Agriculture, Univ. of Wisconsin	June, 1958
Elroy C. Jensen, D.V.M.	Autogenous Skin Grafting in the Dog	B. W. Kingrey	Dept. of Med. & Surgery Div. of Vet. Med., Iowa State College	June, 1958
Robert L. Judkins, D.V.M.	Microscopic Anatomy of the Deer Antler	R. W. Davis	Anatomy Dept. College of Vet. Med., Colo. State Univ.	August, 1958
Horace C. Morgan, D.V.M.	A Comparison of Selected Liver Function Tests for Use in Veterinary Medicine	C. H. Clark	School of Vet. Med., Ala. Polytechnic Institute	June, 1958
Raymond L. Morter, B.S. D.V.M.	Histopathology of the Bovine Placenta in *Leptospira Pomona*	E. V. Morse	Dept. of Microbiology & Public Health College of Vet. Med., Mich. State Univ.	June, 1958
Govind R. Murkibhavi, C.B.V.C. P.G.R.V.R.I.	A Survey of Hepatic and Pancreatic Dysfunction in Dogs	J. E. Mosier	School of Vet. Med., Kansas State College	June, 1958
Fred C. Neal, D.V.M.	Chloramphenicol in the Treatment of Bovine Mastitis	R. D. Turk	School of Vet. Med., A. & M. College of Texas	May, 1958
James A. Palotay, D.V.M.	The Treatment and Prophylaxis of Shipping Fever in Beef Cattle	Rue Jensen	Pathology Dept. College of Vet. Med., Colo. State Univ.	August, 1958
Richard C. Piper, D.V.M.	Pathological Study of Canine Blastomycosis	Clarence Cole	Dept. of Vet. Pathol. College of Vet. Med., Ohio State Univ.	December, 1957
William Harker Rhodes, B.A. V.M.D.	Plans for an Ideal Department of Radiology	Eugene Pendergrass, M.D.	Graduate School of Medicine, University of Pa.	June, 1958
Mark P. Rines, B.S. D.V.M.	Studies Relative to Torsion of Bovine Caecum	W. O. Brinker	Dept. of Surgery & Medicine College of Vet. Med., Mich. State Univ.	June, 1958
Jerry Rountree, D.V.M.	Application of the Fluorescent Antibody Technique	S. H. McNutt	Dept. of Vet. Sci. College of Agriculture, Univ. of Wisconsin	June, 1958
C. L. Seger, D.V.M.	The Pathogenesis of Parakeratosis of the Rumen in Lambs Fattened on a Pelleted Ration	J. C. Flint	Pathology Dept. College of Vet. Med., Colo. State Univ.	August, 1958
Indra P. Singh, B.S.V.S.	Thermal Inactivation of Infectious Bronchitis Virus at 56° C.	L. C. Ferguson	Dept. of Microbiology & Public Health College of Vet. Med., Mich. State Univ.	December, 1957
Jhanwarlal Solanki, D.V.M.	The Mammalian Diaphragm and Its Complexities	Walter Venzke	Dept. of Vet. Anatomy College of Vet. Med., Ohio State Univ.	March, 1958

AWARDED MASTER OF SCIENCE (M.S.) DEGREE—*Continued*

Name of student	Title of thesis	Major professor	Dept. and school	Date granted
Milton E. Taylor, B.S. D.V.M.	Antibody Production in the Bovine Udder	R. A. Packer	Dept. of Vet. Hyg. Div. of Vet. Med., Iowa State College	August, 1957
Marcelina Venus, D.V.M.	Studies on *Hyostrongylus Rubidus*	A. C. Todd	Dept. Vet. Sci. College of Agriculture, Univ. of Wisconsin	August, 1957
Kenneth D. Weide, B.S. D.V.M.	The Effect of *Ascaris Lumbricoidest* Infection on Immunity Production by Lapinized Hog Cholera Vaccines	M. J. Twiehaus	School of Vet. Med., Kansas State College	June, 1958
Robert Whiteus, D.V.M.	Consideration in Applying Human Hospital Management Procedures to a Veterinary Hospital	Harold Amstutz	Dept. of Vet. Med. College of Vet. Med., Ohio State Univ.	August, 1957

AWARDED DOCTOR OF PHILOSOPHY (Ph.D.) DEGREE

Name of student	Title of thesis	Major professor	Dept. and school	Date granted
Robert N. Berkman, B.S. D.V.M. M.S.	Bovine Malignant Catarrhal Fever in Michigan	R. D. Barner	Dept. of Vet. Pathol. College of Vet. Med., Mich. State Univ.	June, 1958
Andre Georges Boidin, D.V.M. M.S.	The Pathogenicity of a Pleuropneumonia-like Organism and a Large Sized Virus in Enzootic Pneumonia in Sheep	D. R. Cordy	School of Vet. Med., Univ. of Calif.	July, 1957
William E. Brock, A.B. D.V.M. M.S.	Study of the Pathogenesis of the Anemia in Acute Anaplasmosis	Walter Joel, M.D.	Dept. of Pathol. School of Med., Oklahoma Univ.	June, 1958
Robert M. Claflin, D.V.M. M.S.	Studies on the Etiology and Pathology of Atrophic Rhinitis of Swine	L. M. Hutchings	Dept. of Vet. Sci., Purdue University	June, 1958
John W. Davis, B.S. D.V.M. M.S.	Some Studies of Swine Dysentery	R. K. Jones	Dept. of Vet. Sci., Purdue University	August, 1958
Abdel H. Hamdy, D.V.M. M.Sc.	Pleuropneumonia-like Diseases of Sheep	John Helwig	Dept. of Preventive Medicine College of Vet. Med., Ohio State Univ.	March, 1958
Lyle E. Hanson, D.V.M. M.S.	The Pathogenesis of Virus Hepatitis of the Duck	J. O. Alberts	Dept. of Vet. Pathol. & Hygiene College of Vet. Med., Univ. of Illinois	June, 1957
Thomas Richard Houpt, V.M.D. M.S.	Utilization of Blood Urea in Ruminants	F. Harold McCutcheon	Graduate School of Arts & Sciences, University of Pa.	February, 1958
Andre Lagace, D.V.M. M.Sc.	Toxic and Therapeutic Evaluation of Treatments for Canine Blastomycosis	Clarence Cole	Dept. of Vet. Pathol. College of Vet. Med., Ohio State Univ.	August, 1957
James E. Lovell, D.V.M. M.S.	Cytomorphosis of Porcine Spermatozoa as Related to Artificial Insemination	R. Getty	Dept. of Vet. Anatomy Div. of Vet. Med., Ohio State Univ.	July, 1958
Louis-Philippe Phaneuf, D.V.M. M.S.	Studies on the Secretory Activity of the Duodenum, Pancreas, and Cecum of the Sheep	H. H. Dukes	Dept. of Physiol. N.Y. State Vet. College, Cornell Univ.	September, 1957
Benjamin A. Rasmusen, B.S. D.V.M. M.S.	Blood Groups in Sheep	Clyde Stormont	School of Vet. Med., Univ. of Calif.	June, 1958
C. E. Stevens, B.S. D.V.M.	Studies on the Reflex Regulation of the Ruminant Stomach, with Special Reference to Eructation Reflex	A. F. Sellers & C. M. Stowe	College of Vet. Med., Univ. of Minn.	June, 1958
Melvin W. Stromberg, B.S. D.V.M.	Studies of Congenital Tremor in Pigs	R. L. Kitchell	College of Vet. Med., Univ. of Minn.	July, 1957

AWARDED DOCTOR OF PHILOSOPHY (Ph.D.) DEGREE—*Continued*

Name of student	Title of thesis	Major professor	Dept. and School	Date granted
Edward A. Usenik, B.S. D.V.M.	The Sympathetic Innervation of the Head and Neck of the Horse; Neuropharmacological Studies of Sweating in the Horse	R. L. Kitchell	College of Vet. Med., Univ. of Minn.	August, 1957
Raimunds Zemjanis, D.V.M.	The Effect of Enzyme Inhibitors and Growth Factors on *Vibrio Fetus, Proteus Vulgaris,* and *Pseudomonas Aeruginosa* as Related to Diagnosis of Bovine Vibriosis	H. H. Hoyt	College of Vet. Med., Univ. of Minn.	August, 1957

AWARDED PUBLIC HEALTH DEGREES

Name of student	Degree received	Title of thesis	School	Major professor	Date granted
Ahmed Ezzat H. A. Abdou, B.V.Sc. B.Sc. Ph.D	D.V.P.H.*	—	School of Hygiene, University of Toronto	A. J. Rhodes	June, 1958
John P. Abrahamson, D.V.M.	M.P.H.†	—	School of Public Health, University of Michigan	—	June, 1958
Robert C. Adams, D.V.M.	M.P.H.	—	School of Public Health, University of Michigan	—	June, 1958
G. A. Anderson, D.V.M.	M.P.H.	Toxoplasmosis	School of Public Health, Univ. of N. Car.	John E. Larsh, Jr.	June, 1958
J. P. Blanchet, D.V.M.	D.V.P.H.	Study on the Egg, Its Eventual Contamination and Preservation	School of Hygiene, University of Montreal	Maurice Panisset	June, 1958
Robert P. Botts, D.V.M.	M.P.H.	—	Dept. of Tropical Med. & Public Health Div. of Grad. Med. School of Med., Tulane Univ.	—	June, 1958
Frank B. Clack, B.S D.V.M.	M.P.H.	—	Graduate School of Public Health, Univ. of Pittsburgh	James A. Crabtree	June, 1958
Veito Mourao Crespo, D.V.M. M.D.	D.V.P.H.	—	School of Hygiene, University of Toronto	A. J. Rhodes	June, 1958
Harold W. Casey, D.V.M.	M.P.H.	—	Dept. of Tropical Med. & Public Health Div. of Grad. Med. School of Med., Tulane Univ.	—	June, 1958
H. G. Doran, Jr., B.S. D.V.M.	M.P.H.	Present Public Health Aspects of Rabies in the U. S.	School of Public Health, Univ. of N. Car.	John J. Wright	June, 1958
Stig-Olov Florin, D.V.M.	M.P.H.	—	School of Public Health College of Medical Sciences, University of Minnesota	R. Anderson, M.D. & G. W. Anderson, M.D.	June, 1958
Bernard J. Gahagan, D.V.M.	M.P.H.	—	School of Public Health, University of Michigan	—	June, 1958
J. R. Ganaway, B.A. D.V.M.	M.P.H.	—	School of Hyg. & Pub. Health, Johns Hopkins Univ.	W. H. Price, Ph.D.	June, 1958
Norman D. Heidelbaugh, D.V.M.	M.P.H.	—	Dept. of Tropical Med. & Public Health Div. of Grad. Med. School of Med., Tulane Univ.	—	June, 1958
H. C. Holk, D.V.M.	M.P.H.	—	School of Hyg. & Pub. Health, Johns Hopkins Univ.	P. V. Lemkau, M.D.	June, 1958
Jeanne V.A. Ikeda, D.V.M.	D.V.P.H.	—	School of Hygiene, University of Toronto	A. J. Rhodes	June, 1958
Graham Elmore Kemp, D.V.M.	M.P.H.	—	School of Public Health, University of California	William Reeves	June, 1958

AWARDED PUBLIC HEALTH DEGREES—*Continued*

Name of student	Degree received	Title of thesis	School	Major professor	Date granted
Harvard E. Larson, D.V.M.	M.P.H.	—	Dept. of Tropical Med. & Pub. Health Div. of Grad. Med. School of Med., Tulane Univ.	—	June, 1958
Arthur Leo Lewis, D.V.M.	M.P.H.	—	School of Public Health College of Medical Sciences, University of Minnesota	R. Anderson, M.D. & G. W. Anderson, M.D.	June, 1958
Jacob Archibald DeWitte Lewis, D.V.M.	M.P.H.	—	School of Public Health College of Medical Sciences, University of Minnesota	R. Anderson, M.D. & G. W. Anderson, M.D.	June, 1958
Robert G. Matheney, D.V.M.	M.P.H.	—	School of Public Health, University of Michigan	—	June, 1958
Carl Douglas Olsen, D.V.M.	M.P.H.	—	School of Public Health College of Medical Sciences, University of Minnesota	R. Anderson, M.D. & G. W. Anderson, M.D.	June, 1958
Leon H. Russell, Jr., D.V.M.	M.P.H.	—	Dept. of Tropical Med. & Public Health Div. of Grad. Med. School of Med., Tulane Univ.	—	June, 1958
Paul R. Schnurrenberger, D.V.M.	M.P.H.	—	Graduate School of Public Health, Univ. of Pittsburgh	Horace M. Gezon	June, 1958
Robert M. Schwartzman, D.V.M.	M.P.H.	—	School of Public Health College of Medical Sciences, University of Minnesota	R. Anderson, M.D. & G. W. Anderson, M.D.	June, 1958
Wiley B. Tanner, D.V.M.	M.P.H.	—	Dept. of Tropical Med. & Public Health Div. of Grad. Med. School of Med., Tulane Univ.	—	June, 1958
Wayne Howard Thompson, D.V.M.	M.P.H.	—	School of Public Health College of Medical Sciences, University of Minnesota	R. Anderson, M.D. & G. W. Anderson, M.D.	June, 1958
Val Vangieson, B.S. D.V.M.	M.P.H.	—	School of Public Health, University of Michigan	—	June, 1958
Francis Werner, B.A. B. Agric. Eng. D.V.M.	D.V.P.H.	—	School of Hygiene, University of Toronto	A. J. Rhodes	June, 1958
John O. Wilson, D.V.M.	M.P.H.	—	School of Public Health, University of Michigan	—	June, 1958

•D.V.P.H.=Diploma in Veterinary Public Health; †M.P.H.=Master of Public Health.
The areas filled by a dash (—) indicate that there was no thesis required for the attainment of a degree or the name of a major professor was not given.

AMONG THE STATES AND PROVINCES

California

Alameda-Contra Costa Association.—The Alameda-Contra Costa V.M.A. met at Pland's Restaurant in Oakland, on July 30, 1958.

Dr. John Craige (UP '37), Seaside, discussed "A New Technique for Diagnosis for Common Dermatosis in Dogs."

s/GEORGE H. MULLER, *Secretary.*

Illinois

Dog World Building Destroyed by Fire.—A disastrous fire swept the Judy Publishing Company, 3323 So. Michigan Ave., Chicago, on July 29, 1958, ravaging the building and destroying valuable books, records, and equipment. Will Judy, publisher and editor of Dog World, estimated the damage to be around the vicinity of $120,000.

Established as headquarters for 1958's National Dog Week, September 21-27, much of the promotional and publicity material prepared for the week's observance was lost in the blaze. Temporary offices have been set up and publication of Dog World, the 42-year-old allbreed monthly magazine, will continue with no interruption, as did the arrangements for dog week.

s/HARRY MILLER, *Correspondent.*

Dr. D. W. Anderson Named Assistant Inspector in Charge.—Dr. D. W. Anderson (COL '39) has been named assistant inspector in charge of the Chicago Meat Inspection station of the U.S.D.A. He succeeds Dr. L. J. Rafoth (ISC '43) who was recently transferred to Washington, D.C., as chief staff officer for animal foods.

Before assuming his new duties in Chicago on July 28, 1958, Dr. Anderson served as inspector in charge in Waterloo, Iowa. Since 1940, he has also served in meat inspection work in Sioux Falls, S. Dak.; Orangeburg, S. Car.; New York, N.Y.; and in Storm Lake, Iowa.

Missouri

The Missouri V.M.A. Works in Close Cooperation with the State Fairs.—Members of the Missouri V.M.A. actively participate in all county, district, and state fairs held in Missouri. The services of over 300 veterinarians are needed to carry on the required tests and health examinations of the animals to be exhibited and to give special assistance to the F.F.A. and the 4-H Club girls and boys.

At the Missouri State Fair, Sedalia, and the Ozark Empire Fair, Springfield, the two largest fairs in the state, veterinarians employed by the Missouri Department of Agriculture must be on duty at all times to check the animals, make daily inspections of sanitary conditions, and to detect and isolate any animals showing signs of disease.

Other duties include acting as official track veterinarians at all horse shows and collecting saliva samples from all race winners for the detection of stimulants as required by the American Trotting Association.

New Jersey

New Officers of Metropolitan New Jersey V.M.A.—The annual elections of the Metropolitan New Jersey V.M.A. were held April 16, 1958.

The following officers were elected for the coming year: Drs. L. J. Sanders, Dover, president; J. H. Ripps, Asbury Park, vice-president; J. W. Rich, Arlington, treasurer; and B. M. Weiner, Newark, secretary.

s/BERNARD M. WEINER, *Secretary.*

New York

Roster of State's Examining Board.—The membership of the New York State Board of Veterinary Medical Examiners is currently as follows:

Dr. Louis A. Corwin, 136-21 Hillside Ave., Jamaica, L.I.

Dr. Robert Brown, 90 Beekman St., Plattsburg

Dr. Lyle S. Compton, North Center St., Clymer

Dr. Dana D. Ford, 527 Hyde Park Blvd., Niagara Falls

Dr. John S. Proper, Monroe St., Honeoye Falls

Dr. John R. Leahy, Country Club Rd., Oneonta

Dr. Thurman C. Vaughn, Jr., Clarksville

s/JAMES O. HOYLE, *Secretary, State Board of Veterinary Medical Examiners.*

Virginia

Lt. Col. George F. Dixon New Veterinary Medical Officer.—Lt. Col. George F. Dixon (OSU '43), Arlington, Va., has assumed his new duties in the Office of the Surgeon General of the Army as Chief, Standards and Animal Branch, Veterinary Division. He succeeds Lt. Col. Charles V. Elia (TEX '43) who will enter Johns Hopkins University, Baltimore, Md., for a course in public health.

Colonel Dixon entered the Army in December, 1943. He has served on the faculty of the Army Meat and Dairy Hygiene School in Chicago and has been an instructor in the Department of Veterinary Science at the Army Medical Service School, Brooke Army Medical Center, Fort Sam Houston, Texas.

In 1955, Col. Dixon graduated from the Army Medical Service Officer's advanced course and, just prior to reporting to Washington for his present assignment, he was a graduate at the Command and General Staff College, Fort Leavenworth, Kan.

STATE BOARD EXAMINATIONS

Interested persons can obtain information about applications, fees, deadlines for filing applications, and exact time and place of examinations of the respective boards by writing to the persons whose names and addresses are given below.

BRITISH COLUMBIA—November, 1958 (usually end of the second week; Vancouver. G. L. Stovell, British Columbia Veterinary Association, 3187 West 43rd Ave., Vancouver 13, secretary.

NEW YORK—Next written examination will be held Dec. 2-5, 1958, at New York, Albany, Syracuse, and Buffalo; the practical examination will be given on Nov. 14, 1958, at Ithaca. James O. Hoyle, 23 South Pearl St., Albany 7, secretary, State Board of Veterinary Medical Examiners.

TEXAS—Next licensing examinations will be held Jan. 14-16, 1959; Austin. The completed application must be received in the board office not later than 30 days before the examination date. Mr. T. D. Weaver, 207 Capital National Bank Building, Austin 16, executive secretary, State Board of Veterinary Medical Examiners.

DEATHS

Star Indicates member of AVMA

Norman G. Beaver (ONT '14), 74, Manotick, Ont., Can., died April 23, 1958, in a hospital there, after a short illness.

At the time of his retirement in 1949, Dr. Beaver was employed by the Department of Agriculture, with the Health of Animals Division in Ottawa. He was a member of the Ontario Veterinary Association, the Central Canada Veterinary Association, and of the Defenders Lodge, A.F. & A.M.

Dr. Beaver is survived by two sisters and two brothers.

Edward A. Bruce (ONT '05), 73, Sidney, B.C., Can., died at the Rest Haven Hospital in Sidney, on April 27, 1958.

Born in South Africa in 1884, Dr. Bruce was an animal pathologist with the Department of Agriculture, Division of Animal Pathology, in Saanichton, B.C. He had resided in Sidney for the past 26 years.

Dr. Bruce is survived by his widow, Marguerite McClelland Bruce; two daughters, a sister, a brother, and two grandchildren.

Donald Bruce Fraser (ONT '03), 76, Port Arthur, Ont., Can., died suddenly at his home on March 12, 1958.

After graduation, Dr. Fraser practiced in Thamesville, Ont., for a year before moving to Port Arthur 55 years ago. He was the first veterinary surgeon to establish a practice in that area.

Dr. Fraser was a life member of the Shuniah 287, A.F. & A.M., Shuniah 82 Royal Arch Masons Rhodes Preceptory, Khartum Temple of the Shrine, and the Port Arthur Lodge 244 I.O.O.F. He is survived by his wife, a foster son, and a sister.

★**Robert Gysel** (CVC '93), 90, Chicago, Ill., died in his home Aug. 6, 1958. He had been a life member of the American Veterinary Medical Association since 1953.

Born in Switzerland, Dr. Gysel began his practice treating cattle when he settled in South Chicago, changing to the treatment of pets as the farm area around Chicagoland disappeared.

Dr. Gysel was a member of the Grand Crossing Lodge No. 776, A. F. & A. M., and the Illinois State Veterinary Medical Association. He is survived by one daughter.

Lyman Bruce Jackes (ONT '20), Toronto, Can., died on May 21, 1958.

Besides being a veterinarian, Dr. Jackes was also an historian and journalist. He is survived by his widow, the former Ethel Sunderland; two daughters, a son, and four grandchildren.

★**James Henry O'Brien** (ONT '12), 70, Taunton, Mass., died in the Morton Hospital there on July 29, 1958. He had practiced in Taunton for 25 years.

Dr. O'Brien had held the position of inspector of slaughtering and inspector of animals in Taunton before his retirement. He was a past-president of the Massachusetts Veterinary Association and a member of the Southeastern Massachusetts V.M.A. and of the local Kiwanis Club.

He is survived by his widow, Rea Nuneban O'Brien; a son and a daughter.

★**Don B. Strickler** (CVC '15), 65, Houston, Texas, died July 30, 1958, after a short illness.

Formerly inspector in charge of the Houston Meat Inspection Station, Dr. Strickler had retired from his duties on January 31, of this year. He was a member of the National Association of Federal Veterinarians and of the Veterinary Reserve Corps.

Surviving Dr. Strickler are his widow, Anna P. Lewis Strickler; and a son, Don Jr., of Corpus Christi, Texas.

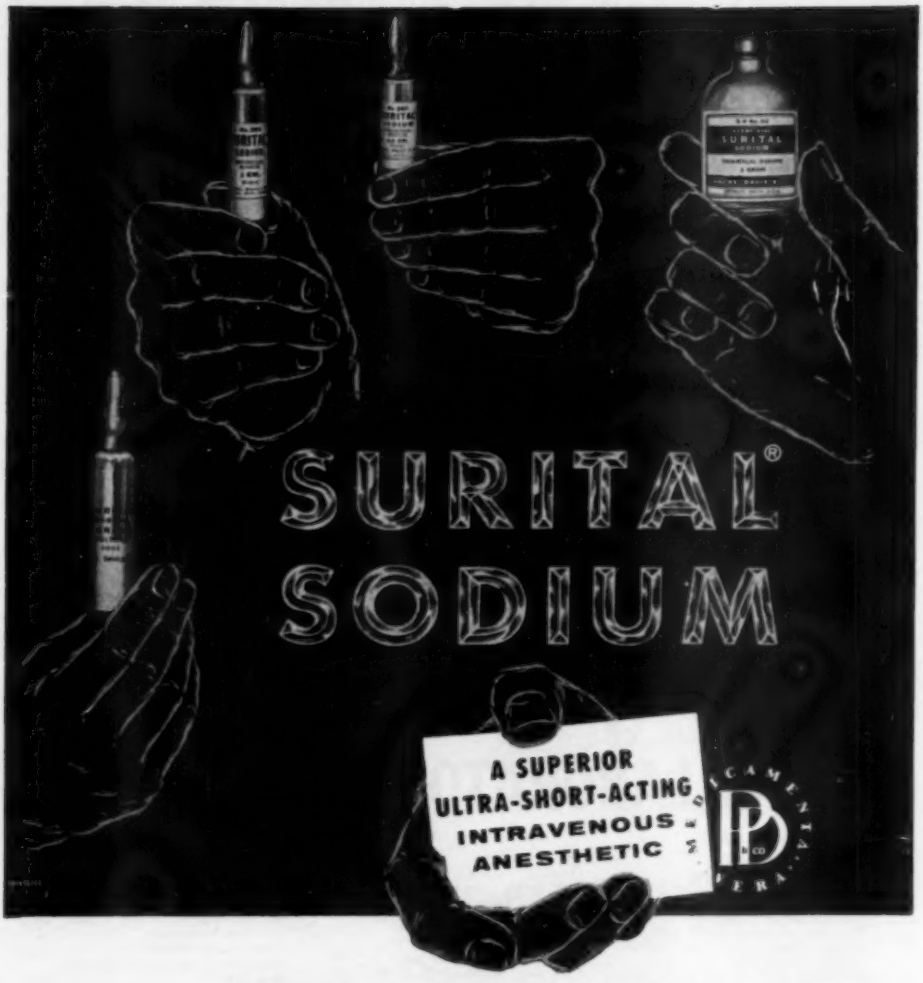
★**Thomas E. Wilson**, 90, Honorary Member of the AVMA and retired board chairman of the meat packing firm of Wilson & Company, died at his Edellyn farm in Lake Forest, Ill., on Aug. 4, 1958.

Born in London, Ont., Mr. Wilson came to Chicago when he was nine years old. He joined the meat packing firm of Morris & Company in 1887, becoming its president in 1913. In 1916, Mr. Wilson became president of the packing firm of Sulzberger & Sons which was renamed Wilson & Company the same year.

During his career, Mr. Wilson was instrumental in helping to organize the American Meat Institute and the National Livestock and Meat Board, and his active interest in farm youngsters, expressed both in time and money, was largely responsible for the formation and growth of the 4-H Clubs. Mr. Wilson also volunteered his talent for leadership and cooperation during World War II to organize the national fat salvage campaign.

His continuing efforts to bring about improvements in agriculture and livestock production resulted in many contacts with veterinary medicine and earned him the respect and admiration of the members of the profession; a fact which was tangibly expressed in his Honorary Membership to the AVMA, in 1945.

Surviving Mr. Wilson are his widow, Elizabeth Foss Wilson; a daughter, Mrs. Helen Williams; and a son, Edward Foss Wilson, assistant secretary of the Department of Health, Education, and Welfare.



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PROFESSIONAL LITERATURE AVAILABLE ON REQUEST

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COMING MEETINGS

Missouri, University of, Annual short course for graduate veterinarians. School of Veterinary Medicine, Columbia, Mo., Oct. 6-7, 1958. Cecil Elder, chairman.

First institute on veterinary public health practice. Annual meeting. School of Public Health, University of Michigan, Ann Arbor, Oct. 6-9, 1958. H. E. Miller, director, continued education.

Iowa State College. Tenth annual veterinary homecoming luncheon. Veterinary courtyard, Oct. 11, 1958, at 11:00 a.m. Robert H. Keith, 621 Pammel Court, Ames, Iowa, publicity chairman.

Florida State Veterinary Medical Association. Annual meeting. Galt Ocean Mile Hotel, Fort Lauderdale, Oct. 12-14, 1958. A. R. Chambers, 6116 Main St., Jacksonville, secretary.

District of Columbia Veterinary Medical Association. Annual all-day meeting. Walter Reed Army Medical Center, Washington, D.C., Oct. 14, 1958. W. I. Gay, 5200 Chandler St., Bethesda, Md., secretary-treasurer.

Eastern Iowa Veterinary Association, Inc. Annual meeting. Hotel Roosevelt, Cedar Rapids, Oct. 16-17, 1958. F. E. Brutsman, Traer, Iowa, secretary-treasurer.

Texas Veterinary Medical Association. Annual meeting. Stephen F. Austin Hotel, Austin, Oct. 19-21, 1958. Paul B. Blunt, 710 Maverick Bldg., San Antonio, secretary.

Illinois, University of. Annual Illinois veterinary conference and extension short course for veterinarians. College of Veterinary Medicine, Urbana, Oct. 23-24, 1958. L. E. Boley, 311 W. William St., Champaign, Ill., chairman.

Southern Veterinary Medical Association. Annual meeting. Claridge Hotel, Memphis, Tenn., Oct. 26-30, 1958. A. A. Husman, P.O. Box 91, Raleigh, N. Car., secretary.

American Public Health Association. Annual meeting. Kiel Auditorium, St. Louis, Mo., Oct. 27-31, 1958. B. F. Mattison, M.D., 1790 Broadway, New York 19, N.Y., executive secretary.

United States Livestock Sanitary Association. Sixty-second annual meeting. Hotel Deauville, Miami Beach, Fla., Nov. 4-7, 1958. R. A. Hendershott, secretary-treasurer.

Mississippi Valley Veterinary Medical Association. Annual meeting. Père Marquette Hotel, Peoria, Ill., Nov. 5-6, 1958. W. P. Hendren, Carthage, Ill., secretary-treasurer.

Midwest Small Animal Association and the A.A.H.A. Regional meeting. Hotel Burlington, Burlington, Iowa, Nov. 12-13, 1958. J. Porter Coble, 2828 S. MacArthur Blvd., Springfield, Ill., secretary.

Nebraska State Veterinary Medical Association. Annual meeting. Hotel Cornhusker, Lincoln, Dec. 3-5, 1958. W. T. Spencer, 1250 North 37th, Lincoln, Neb., secretary-treasurer.

Arizona Veterinary Medical Association. Annual meeting. Yuma Country Club, Yuma, Dec. 7-9, 1958. Robert E. McComb, Jr., Phoenix, program chairman; Thomas E. Lightle, Route 1, Box 917, Yuma, in charge of reservations.

Southern California Veterinary Medical Association. Annual meeting. Beverly Hilton Hotel, Beverly Hills, Jan. 10, 1959. R. J. Schroeder, 1919 Wilshire Blvd., Los Angeles, Calif., program chairman.

Tennessee Veterinary Medical Association. Annual meeting. Noel Hotel, Nashville, Jan. 11-13, 1959. H. W. Hayes, 5009 Clinton Pike, Knoxville, secretary-treasurer.

Oklahoma Veterinary Medical Association. Annual meeting. Mayo Hotel, Tulsa, Jan. 25-27, 1959. M. N. Riemen-

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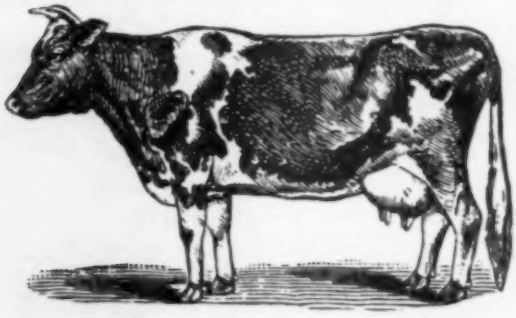

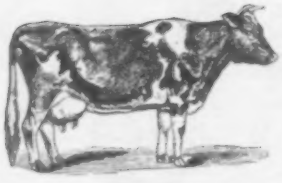

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schneider, 122 State Capitol Bldg., Oklahoma City, secretary.

Minnesota State Veterinary Medical Society. Annual meeting. Leamington Hotel, Minneapolis, Jan. 26-28, 1959. B.S. Pomeroy, University of Minnesota, College of Veterinary Medicine, St. Paul 1, Minn. secretary-treasurer.

Ohio State Veterinary Medical Association. Annual convention. Neil House Hotel, Columbus, Feb. 4-6, 1959. Harry C. Sharp, 1411 W. Third Ave., Columbus, Ohio, executive secretary.

Foreign Meetings

International Veterinary Congress. Sixteenth session. Madrid, Spain, May 21-27, 1959. Prof. Pedro Carda A., general secretary, Calle Villanueva 11, Madrid.

U.S. COMMITTEE: Dr. W. A. Hagan, chairman, New York State Veterinary College, Ithaca, N. Y.; Dr. J. G. Hardenbergh, secretary, 600 S. Michigan Ave., Chicago 5, Ill.

Third World Congress on Fertility and Sterility Amsterdam, Holland, June 7-13, 1959. Dr. L. I. Swaab, Sint Agnietenstraat 4, Amsterdam, Holland, honorary secretary.

Regularly Scheduled Meetings

ALABAMA—Central Alabama Veterinary Association, the first Thursday of each month. Dr. G. W. Jones, Main St., Prattville, Ala., secretary-treasurer.

Jefferson County Veterinary Medical Association, the second Thursday of each month. S. A. Price, 213 N. 15th St., Birmingham, secretary.

Mobile-Baldwin Veterinary Medical Association, the third Tuesday of each month. W. David Gross, 771 Holcombe Ave., Mobile, Ala., secretary.

North Alabama Veterinary Medical Association, the second Thursday of November, January, March, May, July, and September, in Decatur, Ala. Ray A. Ashwander, Decatur, Ala., secretary.

North East Alabama Veterinary Medical Association, the second Tuesday of every other month. Leonard J. Hill, P.O. Box 761, Gadsden, Ala., secretary-treasurer.

ARIZONA—Central Arizona Veterinary Medical Association, the second Tuesday of each month. Keith T. Maddy, Phoenix, Ariz., secretary.

Southern Arizona Veterinary Medical Association, the third Wednesday of each month at 7:30 p.m. E. T. Anderson, Rt. 2 Box 697, Tucson, Ariz., secretary.

CALIFORNIA—Alameda-Contra Costa Veterinary Medical Association, the fourth Wednesday of Jan., March, May, June, Aug., Oct., and Nov. Leo Goldson, 3793 Broadway, Oakland 11, Calif., secretary.

Bay Counties Veterinary Medical Association, the second Tuesday of February, April, July, September, and December. Herb Warren, 3004 16 St., San Francisco, Calif., executive secretary.

Central California Veterinary Medical Association, the fourth Tuesday of each month. R. B. Barsaleau, 2333 E. Mineral King, Visalia, Calif., secretary.

Kern County Veterinary Medical Association, the first Thursday evening of each month. James L. Frederickson, 17 Niles St., Bakersfield, Calif., secretary-treasurer.

Mid-Coast Veterinary Medical Association, the first Thursday of every even month. W. H. Rockey, P. O. Box 121, San Luis Obispo, Calif., secretary.

Monterey Bay Area Veterinary Medical Association, the third Wednesday of each month. Lewis J. Campbell, 90 Corral de Tierra, Salinas, Calif., secretary.

North San Joaquin Valley Veterinary Medical Association, the fourth Wednesday of each month at the Hotel Covell, in Modesto, Calif. Lyle A. Baker, Turlock, Calif., secretary.

Orange Belt Veterinary Medical Association, the second Monday of each month. Chester A. Maeda, 766 E. Highland Ave., San Bernardino, Calif., secretary.

Orange County Veterinary Medical Association, the third Thursday of each month. Donald E. Lind, 2643-N. Main St., Santa Ana, Calif., secretary.

Peninsula Veterinary Medical Association, the third Monday of each month. R. M. Granfield, 2600 W. El Camino Real, San Mateo, Calif., secretary-treasurer.

Redwood Empire Veterinary Medical Association, the third Thursday of each month. Robert L. Chandler, P.O. Box 8, Ukiah, Calif., secretary.

Sacramento Valley Veterinary Medical Association, the second Wednesday of each month. W. E. Steinmetz, 4227 Freeport Blvd., Sacramento, Calif., secretary.

San Diego County Veterinary Medical Association, the fourth Tuesday of each month. H. R. Rossoll, 1795 Moore St., San Diego, Calif., secretary.

San Fernando Valley Chapter SCVMA, the second Tuesday of each month at 7:30 p.m., Hody's Restaurant, North Hollywood, Calif. Dr. V. H. Austin, 14931 Oxnard St., Van Nuys, secretary-treasurer.

San Fernando Valley Veterinary Medical Association, the second Friday of each month at the Casa Escobar Restaurant in Studio City. Dr. Rolf Reese, 23815 Ventura Blvd., Calabasas, Calif., secretary.

Santa Clara Valley Veterinary Association, the fourth Tuesday of each month. Kay Beulley, N. Fourth and Gish Rd., San Jose. Calif., secretary.

Skunk Odor Repels Rattlers.—A mercaptan solution, which has an odor almost identical to that of the skunk, can be used to soak bits of charcoal which, when scattered around a campsite or dwelling, will have enough odor to keep rattlers away but not enough to be unpleasant for man. The odor of mercaptan (and of king snakes, another natural enemy of the rattler) caused the snakes' heart rate to increase markedly. A definite and consistent increase in the rattle snake's heart beat also resulted from human odor. (The old horsehair rope snake-repellent idea might work if the rope had enough human odor.)—*Sci. News Letter (July 26, 1958): 56.*

Southern California Veterinary Medical Association, the last Wednesday of each month. Don Mahan, 1919 Wilshire Blvd., Los Angeles 57, Calif., executive secretary.

Tulare County Veterinary Medical Association, the second Thursday of each month. D. E. Britten, 544 N. Ben Maddox, Visalia, Calif., secretary.

COLORADO—Denver Area Veterinary Society, the fourth Tuesday of every month. Richard C. Tolley, 5060 S. Broadway St., Englewood, Colo., secretary.

Northern Colorado Veterinary Medical Society, the first Monday of each month. M. A. Hammarlund, School of Veterinary Medicine, Colorado A. & M. College, Fort Collins, Colo., secretary.

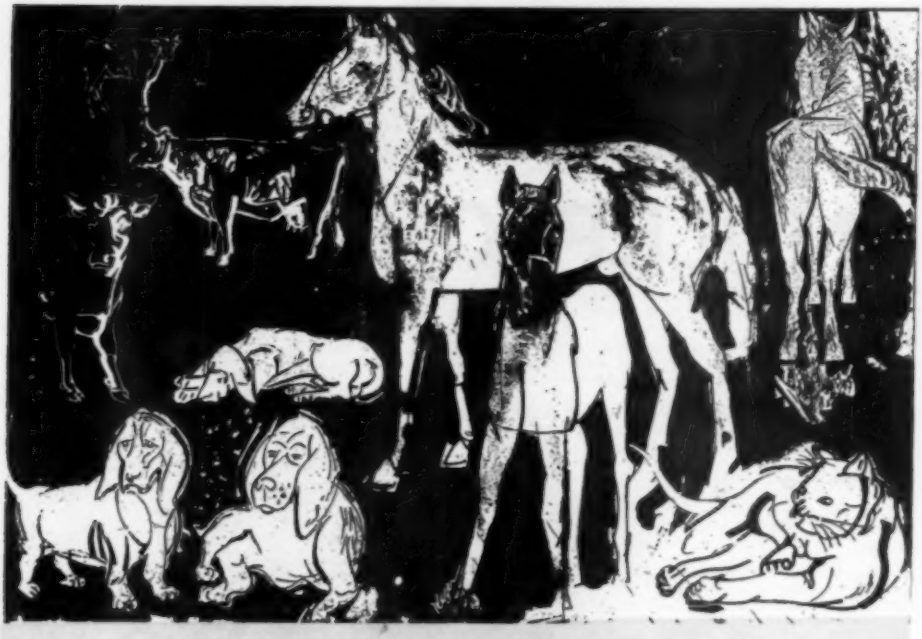
DELAWARE—New Castle County Veterinary Association, the first Tuesday of each month at 9:00 p.m. in the Hotel Rodney, Wilmington, Del. E. J. Hathaway, Clifton Park Manor, Apt. 73-5, Wilmington 2, Del., secretary.

FLORIDA—Central Florida Veterinary Medical Association, the first Tuesday of each month, time and place specified monthly. Jack H. McElyea, 5925 Edgewater Drive, Orlando, Fla., secretary.

Florida West Coast Veterinary Medical Association, the second Wednesday of each month at the Lighthouse Inn, St. Petersburg. William F. Casler, 2540 30th Ave., N., St. Petersburg, secretary-treasurer.

Jacksonville Veterinary Medical Association, the first Thursday of every month. Dodsons Restaurant, P. S. Roy, 4443 Atlantic Blvd., Jacksonville, Fla., secretary.

Northwest Florida Veterinary Medical Society, third Wednesday of each month, time and place specified monthly. T. R. Geci, 108B Catherine Ave., Pensacola, Fla., secretary.



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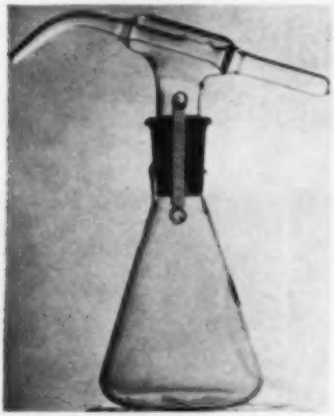

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Mammal-like Reptiles and Evolution.—Four skeletons of small reptiles, about the size of a Cocker Spaniel, probably imbedded in rock formation about 160 million years ago, have been found in Arizona. Unlike other reptiles, their incisor teeth resemble those of present-day rodents, and their cheek teeth resemble those of extremely primitive mammals. These skeletons will be kept in the Smithsonian Institution, Washington, D. C.—*Sci. News Letter (Aug. 2, 1958): 66.*

Palm Beach Veterinary Society, the last Thursday of each month in the county office building at 810 Datura St., West Palm Beach. J. J. McCarthy, 500-25th Street, West Palm Beach, Fla., secretary.

Ridge Veterinary Medical Association, the fourth Thursday of each month in Bartow, Fla. Paul J. Myers, Winter Haven, Fla., secretary.

South Florida Veterinary Society, the third Wednesday of each month. Time and place specified monthly. Frank Mueller, Jr., 4148 E. 8th Ave., Hialeah, Fla., secretary.

Suwannee Valley Veterinary Association, the fourth Tuesday of each month, Hotel Thomas, Gainesville. W. B. Martin, Jr., 3002 N. W. 6th St., Gainesville, Fla., secretary.

Volusia County Veterinary Medical Association, the fourth Thursday of each month. A. E. Hixon, 131 Mary St., Daytona Beach, Fla., secretary.

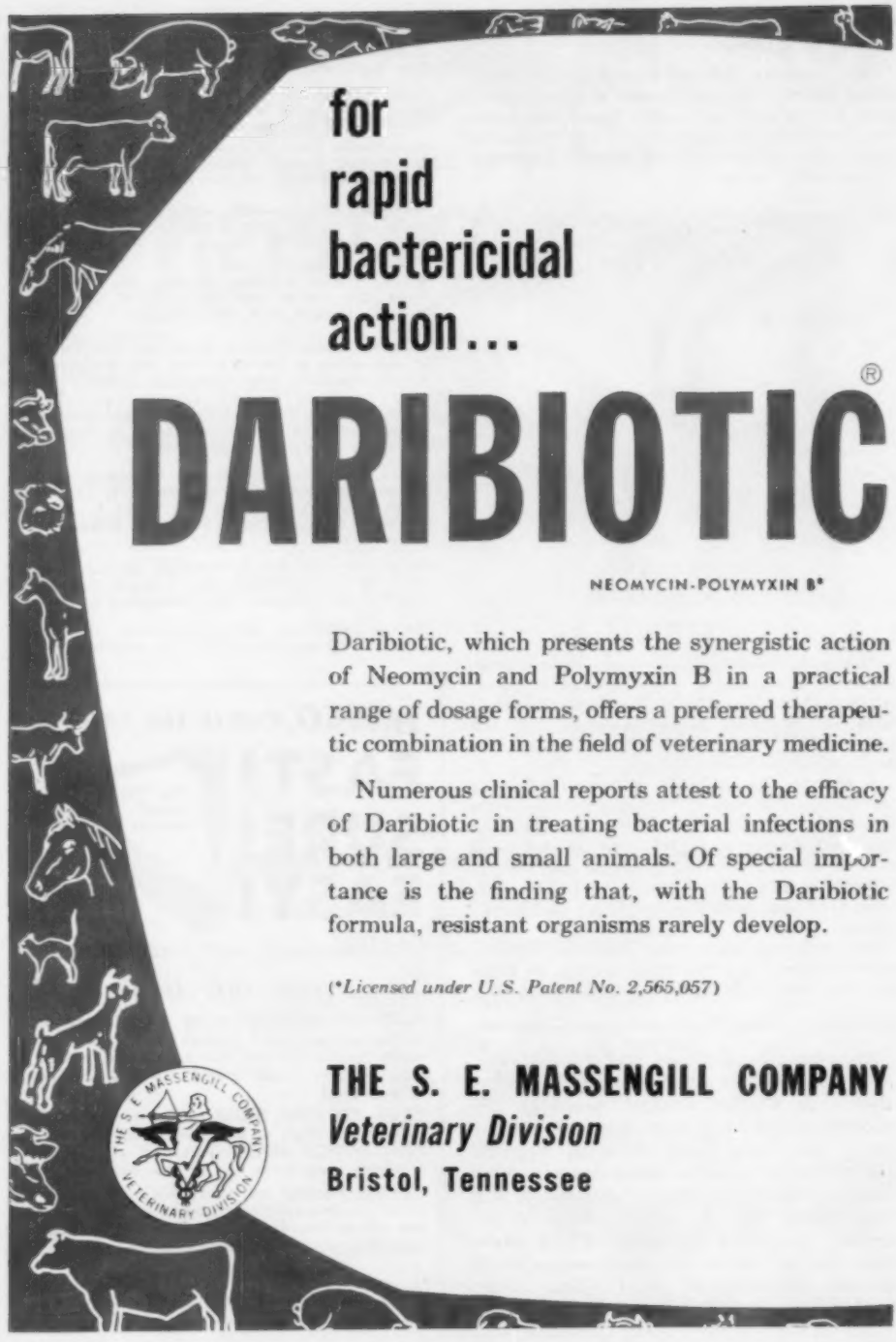
GEORGIA—Atlanta Veterinary Society, the third Thursday of each month at the Elk's Home, 726 Peachtree St., Atlanta. Donald C. Ford, Forest Park, secretary.

ILLINOIS—Chicago Veterinary Medical Association, the second Tuesday of each month. Charles H. Armstrong, 1021 Davis St., Evanston, secretary.

Eastern Illinois Veterinary Medical Association, the first Thursday of March, June, September, and December. A one-day clinic is held in May. Alfred G. Schiller, Veterinary Clinic, University of Illinois, Urbana, secretary-treasurer.

INDIANA—Central Indiana Veterinary Medical Association, the second Wednesday of each month. Peter Johnson, Jr., 4410 N. Keystone Ave., Indianapolis 5, secretary.

Michiana Veterinary Medical Association, the second Thursday of every month except July and December, at



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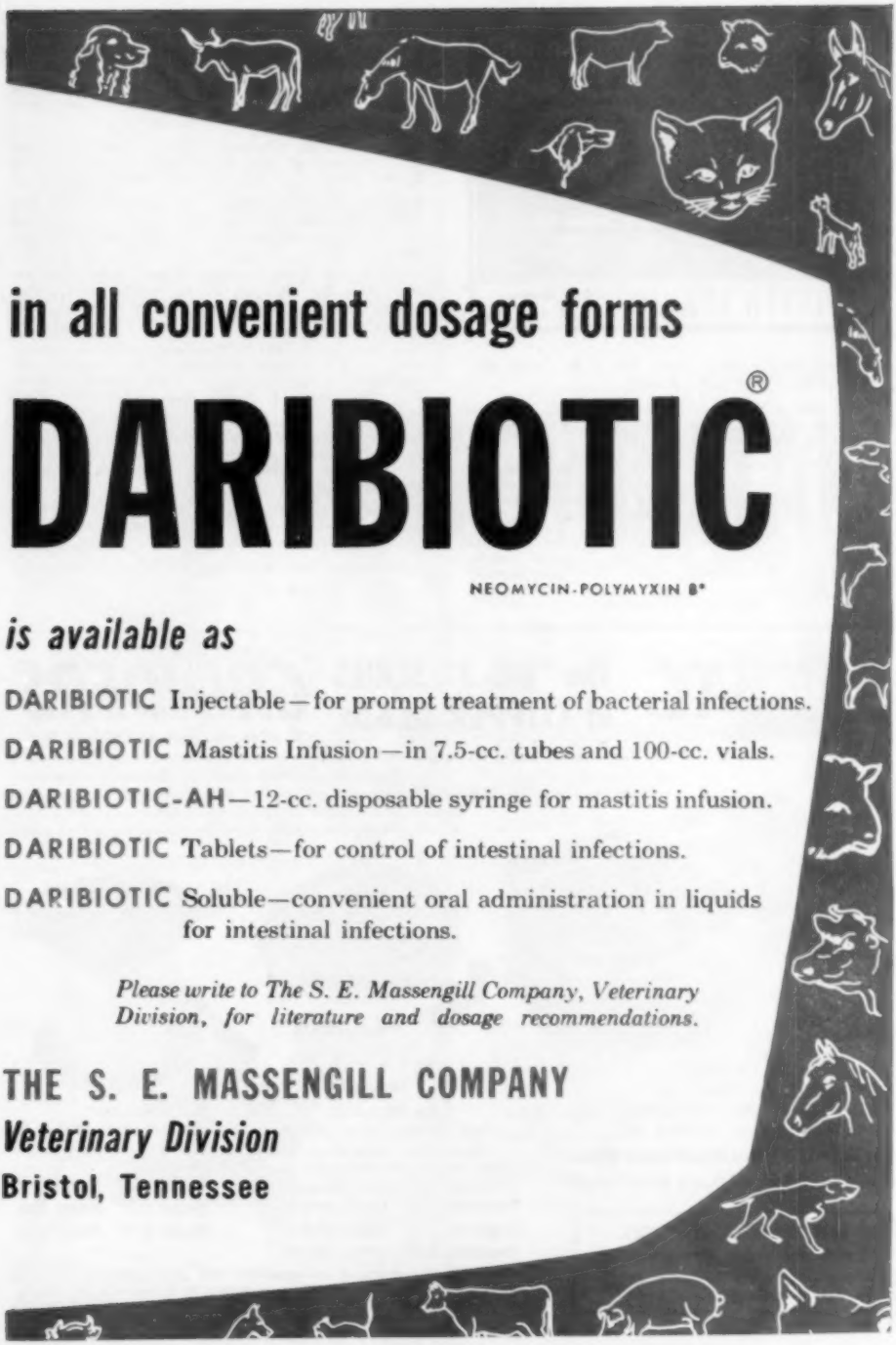

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Veterinary Division
Bristol, Tennessee

the Hotel LaSalle, South Bend, Ind. J. M. Carter, 3421 S. Main St., Elkhart, Ind., secretary.

Tenth District Veterinary Medical Association, the third Thursday of each month. J. S. Baker, P.O. Box 52, Pendleton, Ind., secretary.

IOWA—Cedar Valley Veterinary Medical Association, the second Monday of each month, except January, July, August, and October in Black's Tea Room, Waterloo, Iowa. A. J. Cotten, Grundy Center, secretary.

Central Iowa Veterinary Medical Association, the third Monday of each month, except June, July, and August, at 6:30 p.m., Breeze House, Ankeny, Iowa. John Herrick, Ames, secretary.

Coon Valley Veterinary Medical Association, the second Wednesday of each month, September through May, at 7:30 p.m., Cobblestone Inn, Storm Lake, Iowa. Robert McCutcheon, Holstein, secretary.

East Central Iowa Association, the second Thursday of each month at 6:30 p.m., usually in Cedar Rapids, Iowa. Dr. J. G. Irwin, Iowa City, secretary.

Fayette County Veterinary Medical Association, the third Thursday of each month at 6:30 p.m. in West Union, Iowa. H. J. Morgan, West Union, secretary.

Lakes Veterinary Association, the first Tuesday of each month, September through May, at 6:30 p.m., at the Gardson Hotel, Estherville, Iowa. Barry Barnes, Milford, secretary.

North Central Iowa Veterinary Medical Association, the third Thursday of April, at the Warden Hotel, Fort Dodge, Iowa. H. Engelbrecht, P. O. Box 797, Fort Dodge, secretary.

Northeast Iowa-Southern Minnesota Veterinary Association, the first Tuesday of February, May, August, and November at the Winneslick Hotel, Decorah, Iowa, 6:30 p.m. Donald E. Moore, Box 178, Decorah, Iowa, secretary.

Northwest Iowa Veterinary Medical Association, the second Tuesday of February, May, September, and December, at the Community Bldg., Sheldon. W. Ver Meer, Hull, secretary.

Southeastern Iowa Veterinary Association, the first Tuesday of each month at Mt. Pleasant, Iowa. Warren Kilpatrick, Mediapolis, secretary.

Southwestern Iowa Veterinary Medical Association, the

(Continued on adv. p. 41)

The dangerous, disconcerting interruption in surgery can make the difference between success and failure for the veterinarian—life or death to the patient. And it's an extremely rare occurrence with a reliable, safe anesthetic like

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1. Belloff, G. B.: Calif. Vet. 9:27 (Sept.-Oct.) 1956. 2. Mosier, J. E.: Vet. Med. 52:445 (Sept.) 1957.

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What Is Your Diagnosis?

Because of the interest in veterinary radiology, a case history and radiographs depicting a diagnostic problem are usually published in each issue.

Make your diagnosis from the picture below — then turn the page ▸

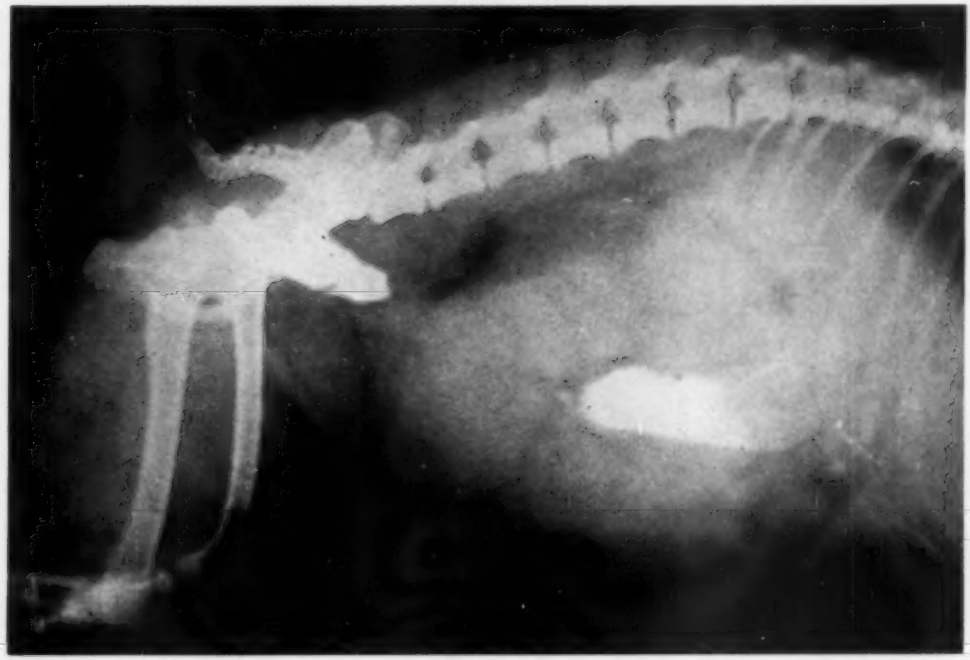

Figure 1

History.—A nonspayed, female Boston Terrier, 5 years old, had not been doing well for three weeks. She had been drinking excessive quantities of water and had intermittent diarrhea and vomiting, a poor appetite, and a slight purulent vaginal discharge. The leukocyte count was 27,000/cm. Barium studies were made of the gastrointestinal tract. A radiograph, lateral recumbent view, was taken five hours after barium solution was given by mouth.

Here Is the Diagnosis

(Continued from preceding page)

Diagnosis.—Pyometra in a Boston Terrier.

Comment.—In this radiograph, the distended horns of the uterus show distinctly. Sometimes it is difficult to visualize the uterus even when the horns are

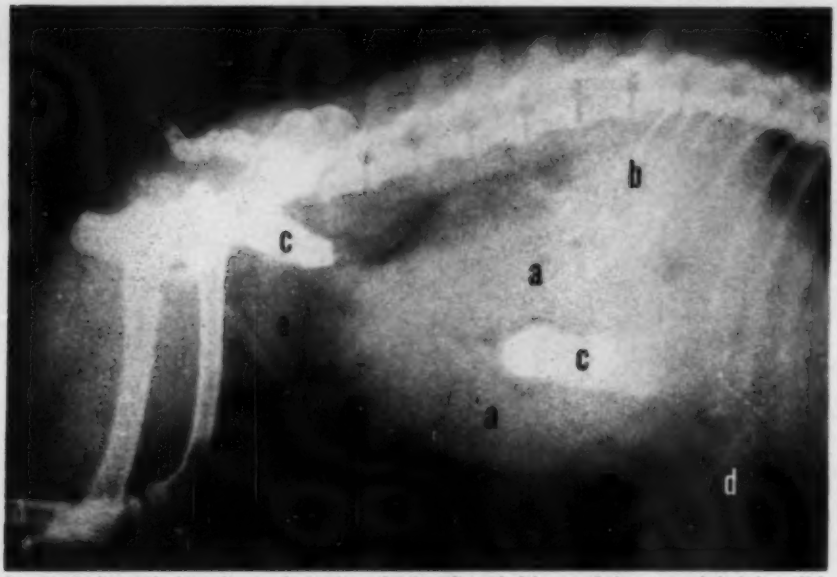

Fig. 2—Radiograph, lateral recumbent view, showing distended horns of the uterus (a), kidney (b), barium in colon (c), liver (d), and urinary bladder (e) in a Boston Terrier.

greatly distended with pus. Pneumoperitoneum usually aids in differentiating the uterus from the intestines and urinary bladder.

This case was submitted by Dr. William A. Smith, Redmond, Wash.

Our readers are invited to submit histories, radiographs, and diagnoses of interesting cases which are suitable for publication.

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Controlled cell propagation greatly enhances antigenic properties while retaining the confirmed safety of a killed virus. The possibilities of reversion to virulence, virus shedding in vaccinated animals, and of vaccine contamination from extraneous virus are eliminated.

Cytohep virus is grown in laboratory equipment in meticulously compounded nutrient fluid, then inactivated with formol. The CELLORIGEN process permits total separation of debris from virus, rendering Cytohep free from foreign protein reactions frequently associated with vaccines derived from eggs or live animal tissues.

A single 2 cc. subcutaneous or intramuscular injection two weeks after weaning builds a high level of protection against hepatitis during the critical period of a dog's life.

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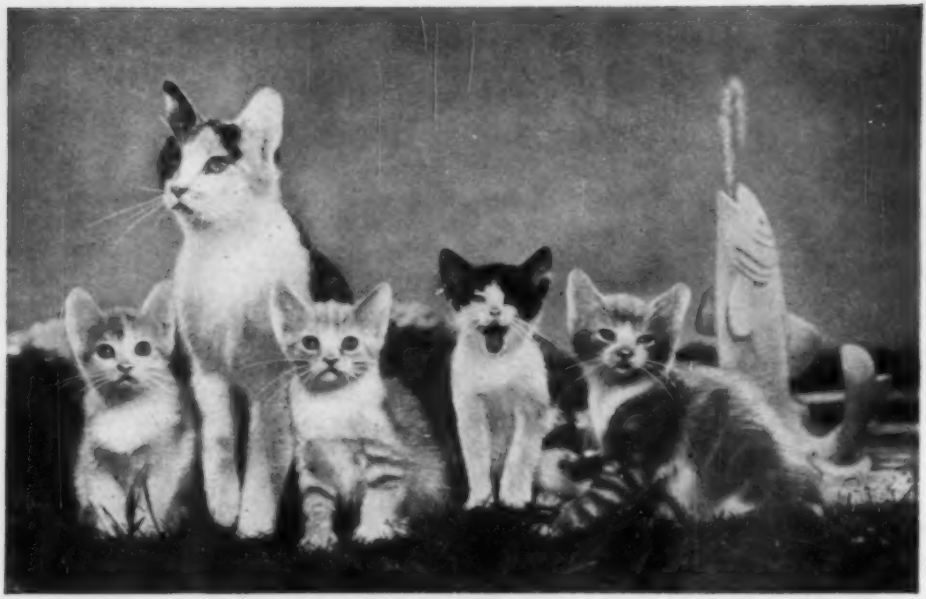

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first Tuesday of April and October. Hotel Chieftain, Council Bluffs, Iowa. J. P. Stream, Creston, secretary.

Upper Iowa Veterinary Medical Association, the third Tuesday of each month at 7:00 p.m., at All Vets Center, Clear Lake, Iowa. Richard Baum, Osage, secretary.

KENTUCKY—Central Kentucky Veterinary Medical Association, the first Wednesday of each month. R. H. Folsom, P.O. Box 323, Danville, Ky., secretary.

Jefferson County Veterinary Society of Kentucky, Inc., the first Wednesday of each month in Louisville or within a radius of 50 miles, except January, May, and July. G. R. Comfort, 2102 Reynolds Lane, Louisville, Ky., secretary-treasurer.

MARYLAND—Baltimore City Veterinary Medical Association, the second Thursday of each month, September through May (except December), at 9:00 p.m., at the Park Plaza Hotel, Charles and Madison St., Baltimore, Md. Norman Herbert, 3506 Joann Drive, Baltimore 7, Md., secretary.

MICHIGAN—Central Michigan Veterinary Medical Association, the first Wednesday of every month at 7 p.m. Frank A. Carter, P.O. Box 78, Carson City, Mich., secretary.

Mid-State Veterinary Medical Association, the fourth Thursday of each month with the exception of November and December. Robert E. Kader, 5034 Armstrong Rd., Lansing 17, Mich., secretary.

Saginaw Valley Veterinary Medical Association, the last Wednesday of each month. S. Correll, Rt. 1, Midland, Mich., secretary.

Southeastern Veterinary Medical Association, the fourth Wednesday of every month, September through May. Gilbert Meyer, 14003 E. Seven Mile Rd., Detroit 5, Mich., secretary.

MISSOURI—Greater St. Louis Veterinary Medical Association, the first Friday of each month (except July and August), at the Coronado Hotel, Lindell Blvd. and Spring Ave., St. Louis, Mo., at 8 p.m. Edwin E. Epstein, 4877 Natural Bridge Ave., St. Louis 15, Mo., secretary.

Kansas City Veterinary Medical Association and Kansas City Small Animal Hospital Association, the third Thursday of each month at the Hotel President, Kansas City, Mo. Frank A. O'Donnell, Parksville, Mo., secretary-treasurer.

NEVADA—Western Nevada Veterinary Society, the first Tuesday of each month. Paul S. Silva, 1170 Airport Road, Reno, Nev., secretary.

NEW JERSEY—Central New Jersey Veterinary Medical Association, the second Thursday of November, January, March, and May at Old Hights Inn, Hightstown, N. J. David C. Tudor, Cranbury, N. J., secretary.

Metropolitan New Jersey Veterinary Medical Association, the third Wednesday evening of each month from October through April at the Irvington House, 925 Springfield Ave., Irvington, N.J. Bernard M. Weiner, 787 Clinton Ave., Newark, N.J., secretary.

Northern New Jersey Veterinary Association, the fourth Tuesday of each month at the Elks Club, Hackensack. Burritt Lupton, 569 Franklin Ave., Wyckoff, secretary.

Northwest Jersey Veterinary Society, the third Wednesday of every odd month. G. L. Smith, P.O. Box 938, Trenton, N.J., secretary.

Southern New Jersey Veterinary Medical Association, the fourth Tuesday of each month at the Collingswood Veterinary Hospital, Collingswood. R. M. Sauer, secretary.

NEW MEXICO—Bernalillo County Veterinary Practitioners Association, third Wednesday of each month, Fez Club,

Ken-L-Ration Names Dog Hero of 1958

A German Shepherd Dog named "Dutchess," who plunged into a lake and swam 300 yards to rescue her 10-year-old mistress, Linda Phillippi, was named winner of the fifth annual Ken-L-Ration gold medal as America's most heroic dog of 1958, on August 5.

For her heroic deed, Dutchess received a $1,000 U.S. bond in her owner's name, a gold plaque, a custom-made blanket, a gold-plated leash and collar, and a year's supply of dog food, in addition to the Ken-L-Ration gold medal. She and her owners received a trip to Chicago to receive the awards at the annual award dinner held in the Chrystal Room of the Palmer House, on August 13. Four other dogs, runners-up in the national competition, received prizes which were presented in their home localities.

Dutchess and her mistress, Linda Phillippi.

The deed that won Dutchess the title of Dog Hero of 1958 took place early last September on a small lake in Excelsior, Minn., a surburban area of Minneapolis, when a hydroplane which Linda's father had constructed began to swamp and turn on end, throwing Mr. Phillippi and three of his children into the lake.

Linda, who could not swim, was saved from drowning when Dutchess swam out to the capsized motorboat and towed her 150 yards to shore while her father struggled to keep the other two children afloat until a neighbor could rescue them.

Albuquerque, N.M. Jack Ambrose, 3018 N. Rio Grande Blvd., Albuquerque, secretary-treasurer.

NEW YORK—New York City, Inc., Veterinary Medical Association of, the first Wednesday of each month at the New York Academy of Sciences, 2 East 63rd St., New York City. C. E. DeCamp, 43 West 61st St., New York 23, N. Y., secretary.

New York State Veterinary College, Annual conference for veterinarians. Cornell University, Ithaca. W. A. Hagan, New York State Veterinary College, Cornell University, Ithaca, N. Y., dean.

Monroe County Veterinary Medical Association, the first Thursday of even-numbered months except August. Irwin Bircher, 50 University Ave., Rochester, N. Y., secretary.

NORTH CAROLINA—Central Carolina Veterinary Medical Association, the second Wednesday of each month at 7:00 p.m. in the O'Henry Hotel, Greensboro. Joseph A. Lombardo, 411 Woodlawn Ave., Greensboro, secretary.

Eastern North Carolina Veterinary Medical Association, the first Friday of each month, time and place specified monthly, Byron H. Brow, Box 453, Goldsboro, N. Car., secretary.

Piedmont Veterinary Medical Association, the last Friday of each month. T. L. James, Box 243, Newton, N. Car., secretary.

Twin Carolinas Veterinary Medical Association, the third Friday of each month at Orange Bowl Restaurant, Rockingham, N. Car., at 7:30 p.m. J. E. Currie, 690 N. Leak St., Southern Pines, N. Car., secretary.

Western North Carolina Veterinary Medical Association, the second Thursday of every month at 7:00 p.m. in the George Vanderbilt Hotel, Asheville, N. Car. Vilu Lind, 346 State St., Marion, N. Car., secretary.

OHIO—Cincinnati Veterinary Medical Association, the third Tuesday of every month at Shuller's Wigwam, 6210 Hamilton Ave., at North Bend Road. G. C. Lewis, Cincinnati, Ohio, secretary-treasurer.

Columbus Academy of Veterinary Medicine, every month, September through May. E. M. Simonson, Columbus, Ohio, secretary-treasurer.

Cuyahoga County Veterinary Medical Association, the first Wednesday in September, October, December, February, March, April and May, at 9:00 p.m. at the Carter Hotel, Cleveland, Ohio. F. A. Coy, Cleveland, Ohio, secretary.

Dayton Veterinary Medical Association, the third Tuesday of every month. O. W. Fallang, Dayton, secretary.

Killbuck Valley Veterinary Medical Association, the first Wednesday of alternate months beginning with February. D. J. Kern, Killbuck, Ohio, secretary-treasurer.

Mahoning County Veterinary Medical Association, the third Tuesday of each month, at 9:00 p.m., Youngstown Maennerchor Club, Youngstown, Ohio. Sam Segall, 2935 Glenwood Ave., Youngstown, secretary.

Miami Valley Veterinary Medical Association, the first Wednesday of December, March, June, and September. J. M. Westfall, Greenville, Ohio, secretary-treasurer.

North Central Ohio Veterinary Medical Association, the last Wednesday of each month except during the summer. R. W. McClung, Tiffin, Ohio, secretary-treasurer.

Northwestern Ohio Veterinary Medical Association, the last Wednesday of March and July. C. S. Alvanos, Toledo, Ohio, secretary-treasurer.

Stark County Veterinary Medical Association, the second Tuesday of every month, at McBrides Emerald Lounge, Canton, Ohio. M. L. Willen, 4423 Tuscarawas St., Canton, Ohio, secretary.

Summit County Veterinary Medical Association, the last Tuesday of every month (except June, July, and August), at the Mayflower Hotel, Akron, Ohio. M. L. Scott, Akron, Ohio, secretary-treasurer.

Tri-County Veterinary Medical Association, the fourth Wednesday of January, May, and September. Mrs. R. Slusher, Mason, Ohio, secretary-treasurer.

OKLAHOMA—Oklahoma County Veterinary Medical Association, the second Wednesday of every month, 7:30 p.m., Patrick's Foods Cafe, 1016 N.W. 23rd St., Oklahoma City. Forest H. Stockton, 2716 S.W. 29th St., Oklahoma City, Okla., secretary.

Tulsa Veterinary Medical Association, the third Thursday of each month in Directors' Parlor of the Brookside State Bank, Tulsa, Okla. Don L. Hohmann, 538 S. Madison St., Tulsa, Okla, secretary.

OREGON—Portland Veterinary Medical Association, the second Tuesday of each month, at 7:30 p.m., Ireland's Restaurant, Lloyds', 718 N.E. 12th Ave., Portland. Donald L. Moyer, 8415 S.E. McLoughlin Blvd., Portland 2, Ore., secretary.

Jen-Sal Journal Wins a First Place Award

The *Jen-Sal Journal*, published by Jensen-Salsbery Laboratories, Inc., Kansas City, Mo., won a first place award in the annual awards program sponsored by the International Council of Industrial Editors for industrial, trade, and associated publications.

Dr. Arthur Freeman (left), editor, and Mr. Ray Ottinger (right), advertising manager and designer of the "Jen-Sal Journal," the first award winner of the 1958 International Industrial Editors' annual contest. Mr. Delbert L. Rucker (center) was general chairman of the 1958 I.C.I.E. conference.

The *Jen-Sal Journal*, a bimonthly, distributed only to members of the veterinary profession, is edited by a veterinarian, Dr. Arthur Freeman (OSU '55). The layout and design are done by Mr. Ray Ottinger, advertising manager at Jensen-Salsbery. On two previous occasions, the *Jen-Sal Journal* has received awards of excellence from the I.C.I.E.

Ed Buesking New President of Corn States Laboratories

Edward Buesking has been named president of Corn States Laboratories, Inc., a wholly new subsidiary of Eli Lilly & Company of Indianapolis. He succeeds Joseph E. Marmon who has been named executive director of production of Eli Lilly & Company.

Edward Buesking

A native of New Palestine, Ind., Mr. Buesking has had a wide range of experience in Lilly production since joining the company in 1937. He was formerly director of the production methods and packaging division.

Mr. Buesking has been a member of the packaging division planning council of the American Management Association and the production and engineering section of the Pharmaceutical Manufacturers Association.

The new products coming from Lilly veterinary medical research are developed, manufactured, and distributed to veterinarians through Corn States Laboratories.

Willamette Veterinary Medical Association, the third Tuesday of each month, except July and August, at the Marion Hotel, Salem. Marvin M. Corff, McMinnville, Ore., secretary.

PENNSYLVANIA—Keystone Veterinary Medical Association, the fourth Wednesday of each month at the University of Pennsylvania School of Veterinary Medicine. Raymond C. Snyder, N.E. Corner 47th St. and Hazel Ave., Philadelphia 43, Pa., secretary.

Lehigh Valley Veterinary Medical Association, the first Thursday of each month. Stewart Rockwell, 10th and Chestnut Sts., Emmaus, Pa., secretary.

Pennsylvania Northern Tier Veterinary Medical Association, the third Wednesday of each odd numbered month. R. L. Michel, Troy, Pa., secretary.

SOUTH CAROLINA—Piedmont Veterinary Medical Association, the third Wednesday of each month at the Fairforest Hotel, Union, S. Car. Worth Lanier, York, S. Car., secretary.

TEXAS—Coastal Bend Veterinary Association, the second Wednesday of each month. J. Marvin Prewitt, 4141 Lexington Blvd., Corpus Christi, Texas, secretary.

VIRGINIA—Central Virginia Veterinarians' Association, the third Thursday of each month at the William Byrd Hotel in Richmond at 8:00 p.m. M. R. Levy, 312 W. Cary Ct., Richmond 20, Va., secretary.

Northern Virginia Veterinary Conference, the second Tuesday of each month. Francis E. Mullen, 1130 S. Main St., Harrisonburg, Va., secretary-treasurer.

Northern Virginia Veterinary Society, the second Wednesday of every third month. Meeting place announced by letter. H. C. Newman, Box 145, Merrifield, secretary.

Southwest Virginia Veterinary Medical Association, the first Thursday of each month. I. D. Wilson, Blackburg, secretary.

WASHINGTON—Seattle Veterinary Medical Association, the third Monday of each month, Magnolia American Legion Hall, 2870 32nd W., Seattle. Roy C. Toole, 10415 Main St., Bellevue, secretary.

South Puget Sound Veterinary Association, the second Thursday of each month except July and August. B. D. Benedictson, 3712 Plummer St., Olympia, Wash., secretary.

WEST VIRGINIA—Kyowva (Ky., Ohio, W. Va.) Veterinary Medical Association, the second Thursday of each month in the Hotel Pritchard, Huntington, W. Va., at 8:30 p.m. Harry J. Fallon, 200 5th St., W. Huntington, W. Va., secretary.

WISCONSIN—Central Wisconsin Veterinary Medical Association, the second Tuesday of each quarter (March, June, Sept., Dec.). D. F. Ludvigson, Ridgeland, Wis., secretary.

Dane County Veterinary Medical Association, the second Thursday of each month. Dr. E. P. Pope, 409 Farley Ave., Madison, Wis., secretary.

Milwaukee Veterinary Medical Association, the third Tuesday of each month, at the Half-Way House, Blue Mound Rd. Dr. R. H. Steinkraus, 7701 N. 59th St., Milwaukee, Wis., secretary.

Northeastern Wisconsin Veterinary Medical Association, the third Wednesday in April. William Madson, 218 E. Washington St., Appleton, Wis., secretary.

Rock Valley Veterinary Medical Association, the first Wednesday of each month. W. E. Lyle, P. O. Box 107, Deerfield, Wis., secretary.

Southeastern Veterinary Medical Association, the third Thursday of each month. John R. Curtis, 419 Cook St., Portage, Wis., secretary.

Wisconsin Valley Veterinary Medical Association, the second Tuesday of every other month. E. S. Scobell, Rt. 2, Wausau, Wis., secretary.

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Wanted—Veterinarians

Wanted—veterinarian with Maryland license to take over small animal hospital near Baltimore while on vacation; after February 10. Excellent opportunity to pick up experience. Address "Box P 33," c/o JOURNAL of the AVMA.

Veterinarian wanted for mixed practice in fast-developing dairy and livestock area in northwestern Arkansas. Madison County Rural Development Committee, Box 398, Huntsville, Ark.

Recent graduate wanted to assist in small animal practice in District of Columbia. Contact Dr. Edward Kramer, 7731 Alaska Ave., N.W., Washington, D.C.

Wanted: Connecticut licensed veterinarian to assist in mixed practice. Contact Dr. D. B. Bender, 46 Poquonock Ave., Windsor, Conn., for further details.

Veterinarian wanted—to assist in mixed practice in central Oklahoma. Give complete details including salary expected. Addresss "Box R 6," c/o JOURNAL of the AVMA.

Veterinarian wanted to assist in mixed practice in Indiana. State experience, references, and salary expected. Opportunity for future. Address "Box R 7," c/o JOURNAL of the AVMA.

Veterinarian wanted—in northern Iowa, large animal practice. Salary open with possibility of partnership arrangement at end of first year if satisfactory. Please state age, experience. Address "Box R 11," c/o JOURNAL of the AVMA.

Wanted—young veterinarian, N.Y. state license, to run New York City veterinary hospital. Salary and percentage; eventual ownership possible. Address "Box R 13," c/o JOURNAL of the AVMA.

Wanted—veterinarian for well-established hospital and large animal practice. Work to consist mostly large animals. Good working conditions; permanent. Address Dr. F. H. Saunders, 336 E. Lafayette St., Stockton 3, Calif.

Wanted—veterinary associate in mixed practice leading to partnership for right person. State age, salary expected, service and marital status. Wisconsin license necessary. Address "Box R 15," c/o JOURNAL of the AVMA.

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Relief veterinarian, experienced and competent, will operate your practice while you vacation. Available New York City and suburbs. Licensed in New York and Connecticut. Address "Box P 9," c/o JOURNAL of the AVMA.

Norwegian veterinarian, 1954 graduate, age 32, wants training position (1½ years) in small animal or mixed practice. Experienced; prefer West. Address "Box R 4," c/o JOURNAL of the AVMA.

Veterinarian with over five years' experience in successful private practice desires position in research or as staff veterinarian for large dairy, beef, or swine operation. Address "Box R 8," c/o JOURNAL of the AVMA.

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Wanted—Practices

Texas—to purchase small animal hospital; will consider partnership. Nine years' practice experience; have Texas license. Address "Box P 32," c/o JOURNAL of the AVMA.

OSU graduate, 9 years' best practice experience, 33, veteran, desires purchase or lease of going small animal or mixed practice. Ohio, Indiana, Illinois licenses. Any good location considered. Address "Box P 35," c/o JOURNAL of the AVMA.

Recent graduate, married, no children, desires to purchase or lease with option to purchase, mixed or small animal practice suitable as one- or two-man practice; will also consider partnership arrangement. All inquiries will be answered and held in strictest confidence. Address "Box R 2," c/o JOURNAL of the AVMA.

Wanted—established small animal practice suitable for two-man operation. Will consider sites east of the Mississippi. Reasonable capital available. Address "Box R 3," c/o JOURNAL of the AVMA.

Experienced veterinarian desires to lease or purchase small or mixed practice. Licensed in Illinois and Missouri. Address "Box R 10," c/o JOURNAL of the AVMA.

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Opportunity for veterinarian—will sell established boarding business complete. Rent large property, comfortable home, desirable section, with option to buy. No veterinarian in this city, wonderful opportunity for the right person. For information write Box 123, Ormond Beach, Fla.

For rent—modern small hospital, located in Staunton, Va. For details write Mrs. C. R. Pastors, Staunton, Va.

For sale—long-established small animal practice (Georgia) with or without real estate on particularly favorable conditions. Address "Box R 1," c/o JOURNAL of the AVMA.

For sale—general practice southeastern Nebraska. Bangs testing available; Nebraska license required. Address "Box R 5," c/o JOURNAL of the AVMA.

For lease—modern small animal hospital in midwestern city over half million population. Potential two-man practice, 100-capacity kennel, new 3-bedroom apartment attached. State qualifications and enclose recent photograph first letter. Address "Box R 9," c/o JOURNAL of the AVMA.

For sale—mixed practice in southern Minnesota; gross, $30,000. Clinic building on acreage, drugs, and equipment: $15,500. Address "Box R 12," c/o JOURNAL of the AVMA.

New clinic, long term lease, Vestavia, Birmingham. Excellent potential. $4,000 cash and $177 a month; equipment at cost and on terms. Address J. I. Griffin, Rt. 11, Box 257, Birmingham, Ala.

For sale—established general practice, central Ohio. Includes real estate, drug inventory, other equipment including 1957 Ranger chute. Immediate possession. Write Box 385, DeGraff, Ohio.

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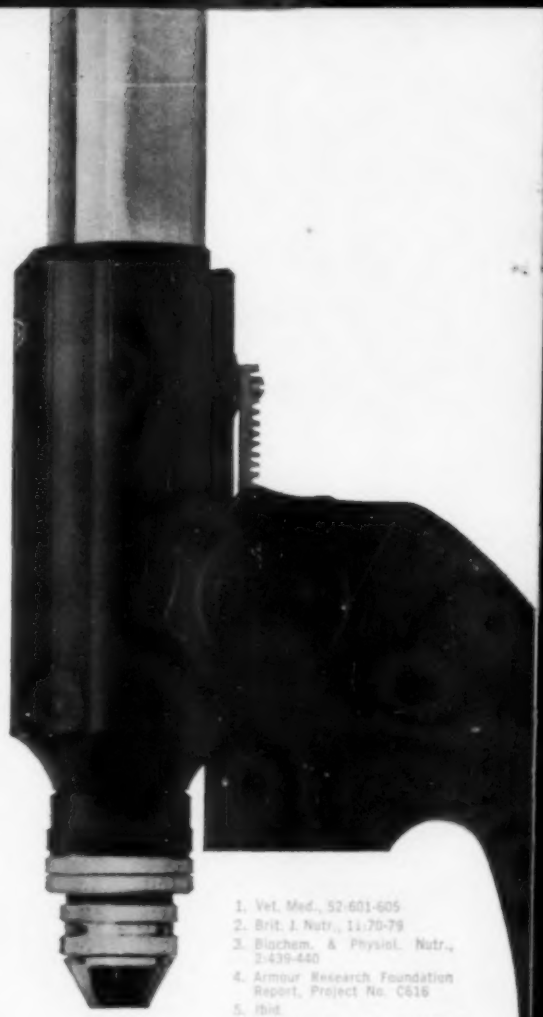

1. Vet. Med., 52:601-605
2. Brit. J. Nutr., 11:70-79
3. Biochem. & Physiol. Nutr., 2:439-440
4. Armour Research Foundation Report, Project No. C616
5. Ibid.
6. J. Dairy Sci., 40 (9):1087-1092

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